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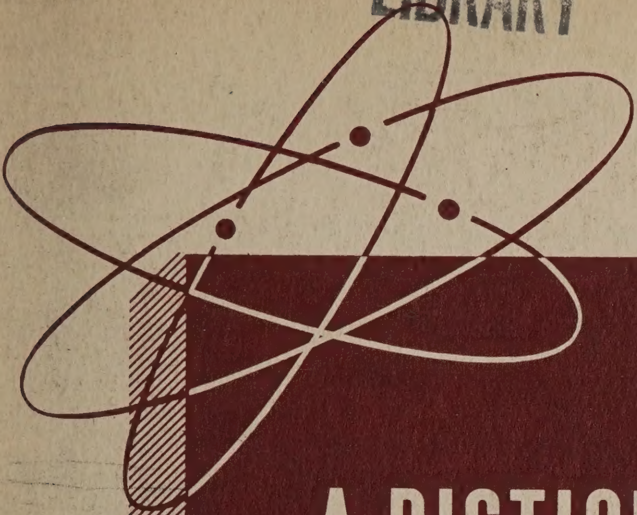

A DICTIONARY OF ELECTRONIC TERMS

CONCISE DEFINITIONS OF
WORDS USED IN RADIO,
TELEVISION & ELECTRONICS

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A DICTIONARY OF ELECTRONIC TERMS

CONCISE DEFINITIONS OF WORDS USED IN RADIO, TELEVISION AND ELECTRONICS

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COMPILED UNDER THE DIRECTION OF
THE TECHNICAL STAFF OF
ALLIED RADIO

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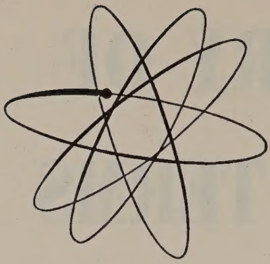

FOREWORD

ELECTRONICS is today the young giant of science that sets the pace for modern technology and exerts a tremendous influence on our daily life. Like every other specialized field of endeavor, Electronics has a language all its own—a special vocabulary which helps make it easier and quicker to describe, explain, and discuss the ideas and equipment with which it works.

The field of Electronics is constantly developing and expanding, and the body of descriptive language is growing rapidly. Within the past few years, startling progress in Television, Industrial Electronics and Nucleonics has emphasized the need for a new, up-to-date publication of simple, easy-to-understand definitions of the words and terms used in these fields.

To meet this need, the Technical Staff of the *Allied Radio Corporation* has compiled this volume of definitions of electronic terms encountered in general commercial and professional usage and in magazine articles, books and lectures.

This Dictionary is intended to serve as a reference guide for engineers, industrial electronic specialists, research men, service men, experimenters and students. Anyone can become surprisingly familiar with the language of Electronics by reading this entire publication carefully just once, a few pages each day.

In addition to the definitions of more than 3650 terms, abbreviations and letters, a section of useful radio data is appended.

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A

A−. (*A negative or A minus*). Symbol usually used to designate the point in a circuit to which the negative terminal of the filament voltage supply is to be connected.

A+. (*A positive or A plus*). Symbol usually used to designate the point in a circuit to which the positive terminal of the filament voltage supply is to be connected.

A battery. The battery used to supply power for the filaments of electron tubes. Sometimes loosely applied to the filament power supply.

abc. Abbreviation for automatic brightness control. On some makes of television receivers, a circuit which automatically varies the brightness and contrast controls of the receiver in proportion to changes in room lighting.

aberration. Used in television. The failure of all light rays in an optical system to be brought into the same focus.

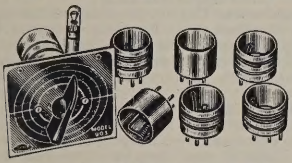
abnormal glow. In a glow tube, a discharge of such current magnitude that the cathode area is entirely covered by glow. Further increase in current results in rise in current density and tube drop.

abohm. The electromagnetic unit of resistance. One abohm is equal to one one-thousand-millionth (10^{-9}) ohms.

AB power pack. Combination of A and B batteries in one housing or package supplying power to vacuum tubes of an electronic device. Usually used with portable radio receivers, amplifiers or test equipment.

absolute scale of temperature. The Kelvin scale. Degrees are equal to those of the centigrade scale, but start at absolute zero, which is −273°C. To convert centigrade to absolute, add 273°.

absorption. Process of causing to be taken up or to disappear. Absorption of radiation by dielectrics occurs most significantly at extremely high frequencies. Absorption wattmeters for microwaves use a variety of conducting materials—the energy appearing as heat. Sound absorbing materials figure in the design of acoustic equipment.



Absorption Wavemeter and Coils

absorption wavemeter. A device for measuring wavelength or frequency of a radio wave. Usually consists of a tunable resonant circuit with (or without) an indicator to show when device is absorbing maximum energy from circuit being tested. When maximum absorption takes place, device is tuned to same wavelength or frequency as circuit under test. Also used to determine amplitude of harmonics of the frequency under test.

abvolt. The electromagnetic unit of potential. One abvolt is equal to one one-hundred-millionth (10^{-8}) volts.

AC, a.c. Abbreviations for alternating current.

accelerating electrode. One or more internal parts of an electron tube used to increase the velocity of electrons between two or more other tube elements.

acceleration. Rate at which velocity changes. Speed-up or slow-down (slow-down being negative acceleration or deceleration). Electrons are given accelerations by the potentials applied to the elements of tubes. Acceleration is expressed as the amount of velocity change which occurs in a unit time interval. For example, an electron increases in speed from two hundred million to three hundred million centimeters per second in one second. Its acceleration is one hundred million centimeters per second per second.

accelerator. The second anode of a cathode ray tube. Since it operates at a high positive potential with respect to the cathode, it increases the velocity of the stream of electrons through the tube. Commonly referred to as the *accelerating anode*. Also, various complete systems designed to produce acceleration, such as particle accelerators used in nuclear physics.

accelerometer. An instrument or transducer for measuring the rate of change of velocity.

accentuation. The emphasizing of any certain band of frequencies in an amplifier or electronic device, and applied particularly to the higher audio frequencies in frequency-modulated (FM) transmitters.

AC-DC. Term applied to electronic equipment indicating it is capable of operation from either an alternating current or a direct current primary power source.

acetate. Refers to cellulose acetate. A chemical compound basic in the mixture used to coat discs for making instantaneous recordings. Example: acetate disc.

achromatic. Without color. In television, a black and white picture with shades of intermediate gray.

acorn tube. Button or acorn-shaped vacuum tube for ultra high frequency applications. Tube has no base, the electrodes being brought out through the glass envelope at the sides, top and bottom. High-powered types are popularly known as a "door-knob".

acoustic. Pertaining to the production, transmission, reception or effects of sound.

acoustic feedback. The transfer of sound waves from a loudspeaker or end terminal to any previous component such as a microphone, electron tube, phonograph pickup, etc. Acoustic feedback may be audible or sub-audible and also super-audible. When audible it may cause squealing, howling, motor-boating, etc. It may cause overloading of components and distortion or both. When controlled it is sometimes used to strengthen weak audio frequencies.

acoustic labyrinth. A baffle or sounding board arranged and designed for use with a loudspeaker. It prevents resonance and reinforces bass response. See labyrinth baffle.

acoustic radiator. The cone part of a loudspeaker.

ac receiver. Also ac amplifier or ac equipment. A term applied to an electronic device indicating that it is capable only of operating from an alternating current primary power source.

AC spectrum. The frequencies from the lowest to the highest of alternating currents. 25, 50 and 60 cycles/sec. are used for power; 15 to 20,000 are audio frequency, 10 kilocycles to 100,000 megacycles are radio frequency.

activation of emitter. Process of sensitizing the cathode surfaces of vacuum tubes. Consists of a heating schedule which involves temporary overheating of elements. Thoriated tungsten and oxide coated cathodes may be reactivated several times in the process of manufacture.

active component of power. See average value of power.

active lines. Television term denoting those of the possible 525 television image lines which are visible on the screen. Inactive lines are blanked out during retrace time.

adapter. Any device used for changing temporarily or permanently the terminal connections of a circuit or part.

Adcock antenna. A system of two or more vertical conductors arranged for reception or transmission of radio waves, such that the interconnecting horizontal wires have little or no pickup.

Adcock direction finder. A system of Adcock antennas used for the directional transmission or reception of radio waves.

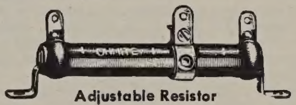
adder. In color TV, circuits which amplify the primary colors from the matrix.

additive color. A system which combines two colors to form a third.

ADF, adf, A.D.F., a.d.f. Automatic direction finder.

adjacent channel selectivity. A radio receiver characteristic by which stations in channels close to the one being received, are rejected.

adjacent channel sound frequency. In television, the sound signal from the channel immediately below the channel to which the set is tuned.



Adjustable Resistor

adjustable resistor. A resistor whose resistance can be changed mechanically. Also adjustable voltage divider.

admittance. The measure of the ease with which an alternating current flows in a circuit. It is the reciprocal of impedance. Strictly, it is the square root of the sum of the conductance squared and the susceptance squared. Admittance is measured in mhos. The symbol is Y.

advance ball. A round support riding ahead of the cutting stylus on a recording disc, and used to maintain uniform cutting depth regardless of surface defects.

Advanced Class license. A class of United States Amateur license. New Advanced Class licenses are no longer being issued, but those already holding the license may have it renewed. Advanced Class licensees originally were permitted to operate radiotelephone transmitters on a greater number of frequency bands than were General Class licensees. However, holders of the General Class license now have the same privileges.

aerial. A system of wires or electrical conductors employed for reception or transmission of radio waves. Specifically, a radiator which couples the transmission line or lead-in to space, for transmission or reception of electro-magnetic radio waves. *Syn.:* antenna.

A.E.S. Abbreviation for Audio Engineering Society.

AF. Abbreviation for audio frequency.

AFC. Abbreviation for automatic frequency control.

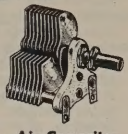
afterglow. The gradually diminishing glow of light left on a fluorescent surface after bombardment by electrons. (*E.g.*, the spot on the face of a television tube.) Also referred to as *persistence* or *phosphorescence*.

AGC. Automatic gain control used in television.

aging. Term applied to electronic components that have been stored (sometimes under power) until their characteristics have become essentially stable and constant.

A.I.E.E. American Institute of Electrical Engineers.

air capacitor. A capacitor whose dielectric is air.



Air Capacitor

air cell A Battery. A non-rechargable wet cell battery delivering an average 2.0 volts. Its carbon electrodes are porous and absorb oxygen from the air during use. Rated life in normal radio receiver use is from 500 to 1500 hours depending on battery size and drain.

air column. The air space within a horn or acoustic chamber.

air core. Descriptive term for coils or transformers which have no iron in their magnetic circuits, and are used chiefly in radio frequency circuits or for alternating current ammeter multipliers.

air gap. A path for passage of electrical, or magnetic energy through air. Examples: The air gap in a spark gap; the spaces between sections of an iron-core transformer.

air gap crystal holder. A device consisting of two plates for holding a piezoelectric crystal such that a small air gap exists between the top plate and the crystal.

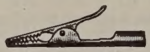
airplane dial. Round radio receiver dial over which a pointer rotates to indicate the frequency of the station being received. Term comes from similarity to an aircraft instrument dial.

align. To adjust or tune one or more circuits so that they operate to predetermined specifications.

Aligning Tool

aligning tool. Small screwdriver, socket wrench or special tool of non-magnetic material used to tune or align circuits.

Allen screw. Screw, generally used as a set-screw, having recessed hexagonal hole in the head. Usually turned by a hexagonal rod called an Allen wrench.



Alligator Clip

alligator clip. A long-nosed metal clip with meshing jaws used on test leads to make temporary connections.

all-metal tube. A vacuum tube with a metal envelope instead of glass. Electrode leads are passed through insulating glass beads fused into the metal. Also called a metal tube.

alloy. A mixture of two or more metals. Examples: Brass (zinc and copper), solder (tin and lead), bronze (copper and tin).

Allstrom relay. An extremely sensitive type of relay which is used to actuate an ordinary, less sensitive relay.

all-wave antenna. (*Or aerial.*) A system of conductors designed to receive or radiate radio waves over a wide range of frequencies. It may be a single doublet antenna or a combination of several doublets.

all-wave receiver. Term applied to a radio receiver capable of receiving stations on all commonly used broadcast wavelengths as well as short-wave bands. Some such receivers include long-wave reception. The most common all-wave receivers tune from about 500 kc to 30 mc.

alnico. Alloy of iron with aluminum, nickel and cobalt, used to make permanent magnets for loudspeakers, motors, dynamotors, meters and motor-generators. Has characteristic of holding magnetism indefinitely. Alnico is usually known by an alloy number. Formerly the alnico was Alnico III; now a more powerful alloy has been created known as Alnico V.

Alpha particle. A group of fundamental particles consisting of two protons and two neutrons, equivalent to the nucleus of a helium atom. It is one of the products given off during radioactive decay.

alternate channel. A term most commonly used in mobile VHF communications. Refers to a transmitting or receiving channel which is two channels higher in frequency or two channels lower in frequency than a given channel.

alternating current. Electric current such as usually supplied by power lines. This is usually produced by rotating machines. The ideal form is sinusoidal. Current results from a surging back and forth of electrons in the lines. Current flow from zero to maximum through zero to minimum and back to zero constitutes one cycle. An alternation is half a cycle. The number of cycles per second (cps) is the frequency. Power frequencies are of the order of 60 cps; but the term ac is used in connection with other frequencies to distinguish varying frequency currents from dc components.

alternator. A device, electronic or electro-magnetic-mechanical, for producing alternating current.

altimeter. Any instrument for measuring vertical elevation of an object above a given level, as, the ground or sea level. Electronic altimeters utilize the radar principle of reflected waves.

aluminized screen. A type of screen on TV picture tubes. The phosphor screen is coated on the inside with a thin layer of deposited aluminum. The aluminum is thin enough for the electron beam to penetrate it and activate the phosphor. The aluminum acts as a mirror so that a large percentage of the light, which otherwise would be lost, is reflected forward toward the viewer. Aluminized Screens generally provide brighter, more contrasted pictures.

AM. Abbreviation for amplitude modulation.

amateur. A term applied in radio specifically to the group of validly licensed radio operators whose interest is non pecuniary and non-commercial. Amateurs are familiarly known as "hams."

amateur bands. Certain bands of radio frequencies assigned exclusively to the radio amateurs by competent authority which in the U.S.A. is the Federal Communications Commission (FCC).

The most active amateur bands are:

1,800 to 1,825 kc.	14,000 to 14,350 kc.
1,875 to 1,900 kc.	21,000 to 21,450 kc.
1,900 to 1,925 kc.	28,000 to 29,700 kc.
1,975 to 2,000 kc.	50 to 54 mc.
3,500 to 4,000 kc.	144 to 148 mc.
7,000 to 7,300 kc.	

The first two bands are assigned to Eastern U.S.A.; the next two are assigned to Western U.S.A. and possessions. All others are world-wide.

amateur station. A validly licensed radio transmitter station owned and operated by one or more amateur operators without pecuniary or commercial gain.

amateur station call letters. Identifying call signal assigned to a licensed amateur operator to identify his station. Amateur calls in a given country begin with a one or two-letter prefix followed by a location-indicating numeral and two or three additional letters.

ambient temperature. The temperature of the medium surrounding an object, e.g., the temperature of the air surrounding a transistor. The term is often used to qualify specifications given for temperature-sensitive electronic components, such as transistors, capacitors, crystals, relays, etc.

American Morse Code. A system of dots and dashes for telegraphy. It is rarely used in radio applications but is commonly employed over telegraph lines. In radio, International Code is used because American Morse Code contains spaced dots and dashes which are difficult to read via radio. International Code is sometimes called continental code.

A	.–	H	....	O	. .	V	...–
B	–...	I	..	P	.....	W	.––
C	.. .	J	–.–.	Q	..–.	X	.–..
D	–..	K	–.–	R	. ..	Y	.. ..
E	.	L	—	S	...	Z	... .
F	.–.	M	––	T	—	&	. ...
G	––.	N	–.	U	..–		
1	.––.	5	–––	9	–..–		
2	..–..	6	......	0	—		
3	...–.	7	––..	Period	..––..		
4	....–	8	– ...	Comma	.–.–		

American Wire Gauge. The standard system used for measuring wire size by diameter. Abbreviation is AWG. The system is also referred to as the Brown & Sharpe wire gauge, abbreviated B & S. Wire sizes range from No. 0000 which is the largest, 0.46 inches in diameter, to No. 40 which is 0.003 inches in diameter.

ammeter. An instrument designed to measure current flow in amperes in an electrical circuit. Ammeters are available for either alternating or direct current. A milliammeter measures current flow in milliamperes and a microammeter measures current flow in microamperes. (See galvanometer.)

ampere. A practical unit of current. It is the current flowing through 1 ohm resistance at 1 volt potential. The movement of 6,280,000,000,000,000,000 electrons, at a uniform rate, past a given point in a circuit in one second corresponds to a current of one ampere. Abbreviated amp.

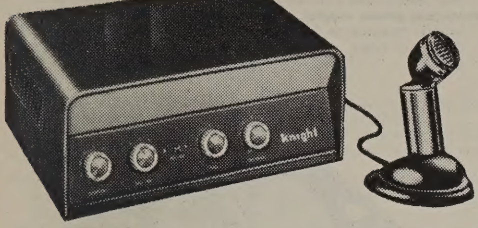
ampere hour. Unit of electrical charge (3600 coulombs) chiefly used to measure capacity of storage or dry batteries. Specifically, one ampere of current flowing for one hour equals one ampere hour charge.

Ampere's Law. A law of electromagnetics which states that a wire carrying a current in a magnetic field is pushed sideways across the field. The effect is greatest when the directions of the current and field are at right angles to one another. The force on the wire is in a third direction at right angles to both. The force depends upon the current and the strength of the field.

ampere turn. A unit of magneto-motive force, obtained by multiplying the current in amperes by the number of turns in a coil.

amplification. The process of increasing the strength of a signal, current, voltage or power and usually produced by vacuum tubes, transformers and feedback circuits.

amplification factor. Rating applied to vacuum tubes indicating the theoretical maximum increase in signal strength which can be provided by a given tube. It is defined as the ratio of a small change in plate voltage to the corresponding change in grid voltage required to maintain the plate current unchanged. Symbol is the Greek letter mu (μ).



Amplifier

amplifier. A device of electronic components with or without vacuum tubes used to increase power, voltage or current of a signal.

amplifier operating angle. That proportionate part of the exciting grid voltage cycle during which plate current flows. It is usually within 120-150 degrees. Usually refers to Class C operation.

amplitude. Term used to describe the maximum value of a sine wave or of a harmonic in a complex wave. It is the largest or crest value measured from zero.

amplitude modulation. The common system of radio broadcasting. It consists of modulating a carrier frequency current by varying its amplitude above and below normal value in step with the audio frequency being transmitted. Abbreviated as AM.

amplitude separation. A television term for the act of separating the synchronizing signal from the video component by using the difference in amplitude levels. Also known as clipping.

analyzer. A test instrument used for checking electronic equipment, parts or circuits. It sometimes includes a special plug-in system which can be inserted in a tube socket to extend the socket terminals for convenience in checking tube measurements.

angle of deflection. In cathode ray tubes, the angle at which the electron stream deviates from the path it would ordinarily follow if it were not deflected.

angle of divergence. Affects spot size in a cathode-ray tube. In a cathode-ray tube, every electron in the stream repels every other electron. As a result of this interaction of electrons, the stream tends to spread or widen. The angle formed by the edge of the stream and a longitudinal line drawn through its center, is called the *angle of divergence*.

angle of lag or lead. Phase angle by which quantities such as voltages, currents or impedances may follow or precede one another. These relations are often shown, in the cases of voltages or currents, by plotting the sinusoidal curves along an axis of angle. They may also be pictured by arrows (vectors) drawn at appropriate angles and with lengths corresponding to the values of the quantities.

angle of radiation. The angle measured between the center of the radiated beam of radio energy from an antenna, and the earth's surface.

Angstrom unit. (Abbr.: Å). A measuring unit for the wavelength of light. One Å equals approximately one two hundred fifty-millionth of an inch. The average wavelength of visual light (yellowish green) is approximately 5,500 Å, or one fifty-thousandth of an inch.

angular phase difference. The phase difference expressed in radians or degrees.

angular velocity. The average rate of change of angular position in a rotation or oscillation. In AC calculations, it is usually expressed in radians per second, or 2π times the frequency. Thus, 60 cycle current has an angular velocity of 377 radians per second. The symbol for angular velocity is ω, the small Greek letter omega.

anode. The radio tube electrode to which the main electron stream flows. It is commonly called the plate, and is usually placed at high positive potential with respect to the cathode. Identified on diagrams by the letter P.

anode sheath. A layer of electrons surrounding the anode in mercury pool arc tubes.

antenna. (*plural:- antennae or antennas*). See aerial.

antenna coil. The coil in a radio receiver or transmitter through which the antenna current flows, or to which the antenna is connected. On most receivers the antenna coil is connected directly between the antenna and ground posts inside the set. In transmitters it may be the coil through which the radio energy is transmitted to the antenna system.

antenna coupler. Electronic device used to connect the receiver or transmitter to the antenna transmission line.

antenna current. The current flowing in the antenna and associated circuits. Amplitude of the indicated antenna current will vary with the position in the circuit in which the measuring device is placed.

antenna transmission line. A system of conductors connecting the antenna proper to the receiver or transmitter, often through a specially designed coupler coil. See antenna coil and antenna coupler.

anti-capacity switch. A type of switch so designed as to introduce comparatively little capacity between the circuits that the switch controls. This tends to minimize attenuation and circuit interaction which might be caused by switch capacity.

anti-microphonic. A term indicating that an audio amplifier, oscillator, or other electronic circuit is relatively immune to mechanical vibrations. These vibrations may disturb the action of a circuit by causing slight displacements in the position of components, particularly the control grids of tubes. A circuit or circuit component which is so affected may produce unwanted background noises, feedback or signal distortion.

antinode. The points of maximum current or voltage in a standing-wave system.

antiresonant circuit. A parallel resonant circuit. A "resonant" circuit is a series resonant circuit.

apc. Abbreviation for automatic phase control.

aperiodic. A radio circuit damped sufficiently to prevent oscillation, *i.e.*, not tuned to any particular frequency. Also, waveforms that do not repeat regularly with time.

aperture. In a television camera tube, the cross-sectional area of the scanning beam.

aperture compensation. Reducing aperture distortion in TV camera tubes by emphasizing the high-frequency components of the picture signal.

aperture distortion. Attenuation of high-frequency components of the picture signal because of the finite cross-sectional area of the scanning beam. Aperture distortion and resultant poor image resolution occur when the scanning beam area covers several mosaic globules simultaneously in the television camera tube.

aperture lens. In electron optics a hole in a plate electrode which separates two electric fields. Electrons passing through the hole are deviated, by experiencing the change in field, in such a way as to produce focusing. Significant in oscillograph tubes, television tubes and electron microscopes.

aperture mask. A thin, perforated plate placed between the three electron guns and the phosphor-dot screen in a color picture tube.

Appleton layer. A region of ionosphere consisting of the F_1 and F_2 layers, which reflects radio waves back to earth under certain conditions.

A-power supply. Source of power for heating the filaments of electron tubes.

aquadag. A colloidal suspension of graphite in water. Used as a coating in cathode-ray tubes to insure electron conduction away from the screen.

arc. An intense luminous discharge formed by the passage of electric current across a space between electrodes or conductors. The discharge is caused by the ionization of the air, vapor or gas between the electrodes. Arcs are characterized by negative volt-ampere relationships.

arc-back. A breakdown of mercury vapor in mercury vapor rectifiers which permits conduction in the opposite to normal direction.

arc drop. Potential difference between the electrodes of an arc. The value is low compared to that of a glow discharge, being of the order of the ionizing potential. Arc drop tends to decrease with increasing current. It represents a loss in energy important in low voltage arc rectifiers.

argon. An inert gas often used in discharge tubes and as a lamp filling.

armature. The moving portion of a magnetic circuit, such as the rotating section of a generator or motor, the pivoted iron part of a magnetic loudspeaker, the spring-mounted iron part of a buzzer, the iron movable part of a relay or vibrator.

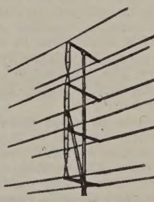
armored cable. An insulated electrical conductor with a tough metallic covering over its insulation. This cover provides protection from abrasion, cuts, or other damage. A popular type of armored cable is BX cable, used in indoor power line circuits.

array. A combination of antennas or antenna elements so arranged that each reinforces the performance of the other. Hence, an array is often used when a great amount of directivity and gain is required.

A.R.R.L. Abbreviation for American Radio Relay League, an organization of licensed amateur radio operators.

aspect ratio. A television term for the ratio of the picture width to height. Standardized at 4:3.

astatic. Possessing non-directional characteristics.



Array

astigmatism. A television term indicating a focus condition in which the spot is not round. This causes different trace widths across the face of the picture tube and a resultant picture distortion.

AT cut crystal. Most extensively used type of crystal for radio-frequency transmitters between 500 kc and 10 mc.

atmospheric interference. Cracking and hissing noises reproduced in the radio loudspeaker due to electrical disturbances occurring in the atmosphere surrounding the earth; these disturbances radiate electro-magnetic waves which are picked up by antenna systems of receivers. Also called static interference, and particularly noticeable during thunderstorms.

atom. Smallest unit of any of the chemical elements. Atoms consist of systems of fundamental particles: protons, neutrons, electrons, etc. These are arranged with the protons and neutrons compressed in a tiny nucleus at the center; the electrons are grouped around it. Atoms of each element have a characteristic structure. The number of protons is the same as the number of electrons, this being the atomic number. The number of protons plus the number of neutrons is the atomic weight.

attenuation. Reduction in the strength of an electrical impulse.

attenuator. A fixed or variable device (usually a type of potentiometer) which is used to reduce the amplitude of an input or output signal to or from an audio or radio frequency circuit. Attenuators are commonly used to control the output level of signal generators, to control the input level to oscilloscopes, and to control the audio level of broadcast programs.

audible. Capable of being heard by the human ear.

audio. Pertaining to currents or frequencies corresponding to normally audible sound waves.

audio amplifier. A device to magnify electric impulses of audio frequency.

audio frequency. A frequency corresponding to an audible sound wave. The extreme limits of audible frequencies vary with the individual and are from about 20 cycles to about 15,000 cycles per second.

audio frequency meter. An instrument for measuring audio frequencies. A commonly used type employs a trigger circuit in which one of the two alternately conducting tubes permits charging of a capacitor by a battery; the other tube permits discharge through a meter. The frequency is given directly by the current divided by the product of capacitance and voltage. Frequencies of low value are measured by impedance bridges.

audio frequency oscillator. A device which generates voltage current or power at audio frequencies.

audiometer. A device to measure hearing ability.

audion. Term (*originally a trade mark*) applied to the first de Forest three-element electronic vacuum tube.

audio transformer. An iron-core transformer used to couple two audio amplifier circuits.

aural. Pertaining to the ear or sense of hearing. In electronics, a term used occasionally instead of *audio* to describe equipment that transmits or receives frequencies that can be heard by the normal ear.

auroral reflection. Reflection of radio waves by an ionized "curtain" in the upper atmosphere of the polar regions. This reflecting "curtain" normally occurs during magnetic storms that are accompanied by auroral displays. Signals reflected in this manner are characterized by a fluttering which tends to make reception difficult.

autodyne reception. A type of radio reception in which the incoming signal beats with an oscillating detector to produce an audible beat frequency. The autodyne principle is employed in regenerative receivers for the reception of CW code signals.

automatic bass compensation. A special resistor and capacitor circuit used in some radio receivers to make low audio frequency notes more audible at low volume control settings. The circuit automatically compensates for the poor response of the human ear to weak low-frequency sounds.

automatic brightness control. A television term. The circuit used to maintain the brightness of the reproduced image at an appropriate average value.

automatic contrast control. A circuit which functions in such a manner that the intensity and contrast of the television picture is maintained at an even, average level. It does this by varying the bias on one or more variable-mu tubes. Automatic contrast control in a television receiver circuit is equivalent to automatic volume control in a radio receiver. By manually setting the average level of the picture, the automatic contrast control maintains this level even though video carriers of different peak amplitudes are tuned in.

automatic direction finder. Abbreviated as ADF. Electronic device, usually of marine or aviation application, which provides a radio bearing to any transmitter whose frequency is known, but direction and location are unknown. *Syn.:* automatic radio compass.

automatic frequency control. An electronic circuit which keeps a superheterodyne receiver, or a transmitter, accurately tuned to a predetermined frequency. Used chiefly in FM receivers. Also used in receivers which are push-button tuned to correct slight inaccuracies in the operation of the tuning system. Abbreviated AFC.

automatic gain control. Abbreviated AGC. In a television receiver, a circuit which performs the same function (for video and audio) as the AVC circuit in a radio receiver. See automatic volume control.

automatic phase control. A tube circuit in color TV receivers which maintains both the frequency and phase of the 3.58-mc color oscillator synchronized with the burst signal.

Automatic Record Changer

automatic record changer. An electrically operated mechanism which automatically feeds, plays, and rejects a number of records in sequence. Consists of a motor, turntable, pickup arm and changer mechanism. Modern changers are designed to play automatically records of 3 sizes and 4 speeds—including the 33-1/3 rpm records introduced by Columbia, 45 rpm records introduced by RCA, 16-2/3 rpm "talking book" records, and the 78 rpm type.

automatic tracking. A method by which a directional antenna is automatically oriented for most favorable reception of a desired signal. Commonly used by radar antenna systems to follow a target.

automatic tuning. An electrical, electro-mechanical or mechanical system which tunes a radio receiver or transmitter automatically to a predetermined and chosen frequency when a button is pushed. In transmitters this has been advanced markedly and dials similar to telephone dials and a vast number of different systems are employed for automatic tuning.

automatic voltage regulator. A device or circuit that functions to maintain terminal voltage at a predetermined value, or varies the voltage according to a predetermined plan.

automatic volume control. A radio circuit which automatically maintains the output volume of the receiver constant within narrow limits while the received carrier signal as picked up by the antenna is varying widely in amplitude. Used in practically all modern receivers, it minimizes annoying fading of distant stations and prevents blasting when tuning suddenly from a weak station to a strong one. In automobile receivers it smooths out the variations in the received signal strength due to riding past obstructions which deplete the signal, and maintains an even output volume at the loudspeaker. Abbreviated AVC.

automatic volume expansion. A circuit which increases the volume range of a radio program or a phonograph record by making the weak passages weaker and the loud passages louder.

autosyn. See Selsyn.

autotransformer. Any transformer of single coil construction where the primary and secondary connections are made to the single coil, and used to change voltage amplitudes.

a.v.c. Abbreviation for automatic volume control.

average value. An average of all the instantaneous values of voltage or current for a half cycle of a sine wave. Average value =0.636 × maximum amplitude.

average value of power. In circuits containing reactance and resistance, the current and voltage values may, at any instant, be of the same or different polarity. Depending on this condition the instantaneous power (ExI) will have a positive or negative sign. The average power will be the net value taken over a cycle. This net power is due to the resistance present in the circuit.

aviation channels. A band of frequencies both below and above the standard broadcast band, assigned exclusively to aircraft and aviation applications.

AWG. Abbreviation for American Wire Gauge.

Ayrton shunt. A device for decreasing the sensitivity, *i.e.*, increasing the range of a galvanometer or similar meter by a series of factors. It is characterized by being applicable to meters of various resistances. The shunt consists of a resistance high in comparison to that of the meter and tapped at various values which are usually 1/10, 1/100, 1/1000, etc. The meter is connected across the whole resistance; the line is connected from one terminal to a tap.

B

B. Letter normally employed to denote the high voltage plate power supply for one or more vacuum tubes.

B−. (*B negative or B minus.*) Symbol used to designate the point in a circuit to which the negative terminal of the plate supply is to be connected.

B+. (*B positive or B plus.*) Symbol used to designate the point in a circuit to which the positive terminal of the plate supply is to be connected.

back electromagnetic force. Abbreviated back-emf. Also called counter-electromotive force. The voltage created in an inductive circuit by a changing current flowing through the circuit. The polarity of the back-emf is opposite to that of the applied voltage, but is never greater in amplitude than the applied voltage.

background controls. In color television receivers, the individual brightness controls for each color.

backheating. Heating of the cathode of a magnetron by the return of electrons to it. Backheating may be sufficient to keep the cathode at emitting temperature without an external A supply as long as operation is continued.

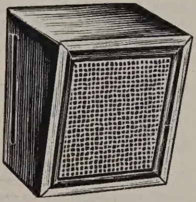
backlash. A form of mechanical hysteresis in which there is a lag between the application of a driving force and the response of the driven object. For example, if the knob of a tuning mechanism must be rotated several degrees before the dial pointer begins to move, the mechanism is said to have backlash. The presence of backlash is most evident when the direction of motion is reversed. Backlash is especially serious in precision systems such as gear trains in servomechanisms.

back-loaded horn. A high-fidelity speaker enclosure employing folded horn design. With this type of design, sound waves from the front of the speaker are fed directly into the room while sound from the rear of the speaker first passes through the folded horn.

back porch. In a TV signal, the horizontal sync pedestal that follows the sync pulse. In color TV the color burst signal.

back wave. Signal transmitted by a radiotelegraph set due to improper adjustment and heard between dots, dashes and during spaces when the key is open. *Syn.:* spacing wave.

baffle. A wood, metal or composition horn or flat surface used with a loudspeaker to increase the length of the air path from the front to the back of the loudspeaker diaphragm, thereby reducing interaction between sound waves produced simultaneously by front and back surfaces of the diaphragm. A baffle thus serves to direct the sound produced by a loudspeaker and improve the fidelity.



Baffle

baffle plate. A flat sheet of metal inserted into a wave guide to reduce the cross-sectional area for wave conversion.

bakelite. A phenolic compound having good electrical resistance, used as an insulating material in the construction of radio parts such as panels, coil forms, tube sockets, etc.

balance. See color balance.

balance control. An adjustment on a stereo amplifier or preamplifier which is used to adjust the relative volume of each stereo channel. When the control is properly adjusted, each channel delivers the same level of sound with a given signal input.

balanced armature loudspeaker. An electro-magnetic sound-producing device used chiefly in magnetic loudspeakers. It has a small moving iron armature which is surrounded by windings carrying audio currents.

balanced modulation. A system of adding sound to radio wave transmission whereby only the side bands are transmitted, the carrier being eliminated. Normally used in single sideband suppressed carrier radiotelephony.

balance to ground. A requirement in certain circuits (*e.g.*, cathode ray tubes) where the voltages of electrodes (such as the deflection plates) must vary symmetrically at any instant above and below ground potential. Very important in differential amplifiers.

balancing capacitor. 1. A capacitor used as part of a balanced circuit, *e.g.* a neutralizing capacitor. 2. The capacitor which makes both sides of a direction finding loop equal as to capacity to ground when antenna is set for minimum signal pickup.

ballast resistor. A special type of resistor used in radio apparatus to compensate for fluctuations in a.c. power line voltage. It is usually connected in series with the power supply to the receiver or amplifier. The ohmic value of a ballast resistor increases rapidly with increases in current through it, thereby tending to maintain essentially constant current despite variations in line voltage.

ballast tube. A ballast resistor consisting of an iron filament mounted inside an envelope filled with hydrogen. The ballast is rated to operate with the filament at the recalescence to temperature for iron: 690°C. Here a crystalline change occurs if the heating current increases slightly. The hydrogen serves to dissipate the additional heat.

Ballast Tube

ballistic galvanometer. A D'Arsonval type galvanometer characterized by a wide suspended coil and long period. Due to the long torque arm of the coil, it has high comparable current sensitivity. Because of the long period, it responds to small quantities of electricity discharged through it by giving a deflection proportional to the total charge.

balun. 1. An antenna-matching device used to permit efficient coupling of a transmitter having an unbalanced output circuit to an antenna having a balanced transmission line. 2. A device for converting balanced to unbalanced transmission lines and vice versa—by placing suitable discontinuities at the junction between the lines, instead of using lumped components.

banana jack. A receptacle that fits a banana plug.

banana plug. A banana-shaped plug. Elongated springs provide a low-resistance compression fit.

band. In radio, frequencies which are within two definite limits and are used for a definite purpose. Thus, the standard broadcast band extends from 550 kc to 1600 kc.

band-elimination filter. Two or more tuned circuits adjusted to attenuate highly a band of frequencies within predetermined upper and lower frequency limits. The graphical result (selectivity curve) is ideally an approximation to a square wave which has the required width.

Banana Plug

band igniter tube. A glow tube in which the discharge is started by voltage applied to an external grid in the form of a metal band wrapped around the envelope.

bandpass coupling. A type of inductive coupling, commonly used between stages in receiving and transmitting equipment. Since bandpass coupling provides relatively linear energy transfer over a wide band of frequencies, it is employed between the IF (intermediate frequency) stages in FM receivers to permit high-fidelity reception of the full transmitted bandwidth. It is also valuable between stages of variable frequency transmitters, since it precludes the need for retuning intermediate stages between oscillator and final amplifier when frequency is changed. Bandpass coupling is accomplished by very close physical placement of primary and secondary windings in the coupling transformer (tight coupling).

band-pass filter. Similar to band-elimination filter except that the frequency band is passed and all frequencies above and below this band are attenuated.

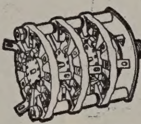
band-selector. See band switch.

bandspread. Any method, mechanical or electronic, of increasing space on tuning scale between stations otherwise crowded and difficult to tune.

bandspread tuning control. Device, usually a small variable capacitor connected in series or parallel with main tuning capacitor of a receiver or transmitter to provide bandspread.

band switch. A switch used to change one or more circuits of a multi-band, radio receiver or transmitter, thus changing bands to which receiver or transmitter can be tuned. *Syn.:* band selector.

bandwidth. A section of the frequency spectrum required to transmit the desired information, whether visual, aural or both. The bandwidth of the average television channel is 6 mc; of a broadcast channel, 10 kc, which is 1/600 that of a television channel.



Band Switch

bank winding of coils. Method of winding wherein two or more layers are wound one turn of each in sequence from one side of the layers across to the other. Low distributed capacity results.

bantam jr. tube. An extremely small glass vacuum tube with a special base, used chiefly in hearing aid units.

bantam tube. A compactly designed tube having a standard octal base but a considerably smaller glass envelope than does a standard glass tube. Bantam tubes are used chiefly in compact table model receivers and in battery-operated portable sets.

bar generator. A test instrument for producing vertical and horizontal bars on the screen of a picture tube. These are used for adjusting the vertical and horizontal linearity and width controls.

barium. An element occasionally used in the cathode coating of vacuum tubes.

Barkhausen-Kurz oscillations. Micro-wave oscillations produced by a triode. The grid is operated at a high positive potential and the plate at a small negative potential with respect to the filament. Electrons overshooting the grid oscillate past it several times before coming to rest. A tuned circuit is placed between grid and plate. In TV, spurious oscillations produced by the horizontal output tube. Causes vertical bars or lines on left side of picture.

Barkhausen oscillations. In a television receiver, transient oscillations in the horizontal output tube. Produces vertical dark bars on the left side of the picture tube.

barrier layer cell. See photovoltaic cell.

bar test pattern. Special test pattern for adjusting color TV receivers. Upper portion consists of saturated colors and white. Lower portion has black and white areas along with the I and Q signals.

base insulator. A very large insulator used as a support and insulator for radio transmission towers. It serves to insulate the tower from the ground. Smaller types are used to support and insulate vertical whip antennas.

base, numerical. A number which, raised to a power, is used to express numerical or literal values. 10 is used as the base of common logarithms; also to express very large or small values in the denary notation, example: the number of electrons in a coulomb is 6 followed by eighteen zeros or 6x10^{18}. The other frequently met base is "ϵ" (2.71828) the base of natural logarithms. It is used extensively in circuit problems involving complex numbers.

base of tube. An adapter connected to several or all of the leads of a tube whereby connection may be made to the tube circuits by placing the base in a socket. There are, in common use, the screw, bayonet and prong bases. Electrodes not connected to the base may be brought out separately to a metal cap.

basket winding. A type of coil winding characterized by a criss-cross pattern so that adjacent turns are far apart except at points of crossing.

bass. Low audio frequencies.

bass booster, also bass boosting circuit. A group of components connected in a circuit so that bass (low) frequencies are emphasized.

bass compensation. Any means, electrical or acoustical, of offsetting the natural drop in the response of the human ear to low audio frequencies at low volume levels.

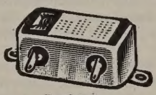
bass control. A manually operated control or switch in a receiver, radiotelephone transmitter, or audio amplifier which causes bass frequencies to be accentuated or attenuated.

bass reflex. A type of speaker enclosure noted for its ability to enhance the bass characteristics of a loudspeaker. Bass reflex enclosures have a volume of up to 10 cubic feet and employ a port opening, the size of which is determined by the volume of the enclosure and the cone resonance of the associated speaker.

bass response. The characteristic of an electronic device to pick up or reproduce bass audio frequencies.

bathtub capacitor. A capacitor enclosed in a metal can with rounded corners like a bathtub.

battery. Two or more dry cells or storage cells connected together to serve as a DC voltage source. Loosely, a single cell is sometimes called a battery.



Bathtub Capacitor

Battery Charger

battery charger. A DC generator, rectifier unit, or any similar electric device, used for recharging a storage battery. Current is caused to flow through the cells in a direction opposite to normal current flow.

bat wing. An elephant-ear shaped radiating element on an FM-TV transmitting antenna. Originally, the element was made of a solid sheet of metal, but has been modified and is now made of open-spaced tubing, retaining its original bat wing shape.

bay. A part of an antenna array.

bayonet base. A type of tube and lamp base having two projecting pins on opposite sides of the smooth cylindrical base; these engage in corresponding slots in the bayonet-shell socket.

bazooka. A device used at the end of a coaxial transmission line to isolate outer conductor from other surfaces. *Syn.:* line balance converter.

B battery. The battery used to supply the dc voltages required by the plates and screen grids of vacuum tubes.

Bayonet Base

BC. Abbreviation for broadcast band.

BCI. Broadcast interference. Terms used by radio amateurs to denote interference by their transmitters with reception of broadcast signals on standard broadcast receivers.

BCL. Abbreviation for broadcast band listener (as distinguished from a radio amateur).

beacon. Radio transmitter or other device designed to indicate exact geographical location or direction. Used for aircraft and ship navigation.

bead. A glass, ceramic or plastic insulator with a center hole employed to insulate center conductor threaded through the hole from the outer surfaces in contact with the bead's exterior.

beam. 1. A colloquialism for a directional antenna array. 2. A stream of electrons passing from the cathode to the plate in a special vacuum tube called a "beam" power tube. 3. A stream of electrons passing from the cathode to the screen in a television or cathode-ray tube.

beam antenna. Antenna array that concentrates radio transmission into a narrow directional beam, or receives radio signals from a narrow sector of the total horizon.

beam bender See ion trap.

beam current. The current in an electron stream of a cathode-ray tube. Beam current rarely exceeds 250 microamps and is usually less than 100 microamps.

beam positioning magnets. See convergence magnets.

beam power tube. A vacuum tube constructed with end shields so that the electrons are concentrated by emerging only at the two opposite sides. The two grids have parallel spacings to further concentrate the electrons in beams. The result is a sufficient electron density near the plate to achieve the effect of a suppressor grid which behaves as a virtual cathode. Performance is similar to a pentode.

beat. A regularly recurring pulsation of amplitude resulting from the combination of two tones or electric waves of different frequencies. Requires a non-linear element for detection. In the case of beats in sound waves, the detector is the ear.

beat-frequency. The frequency obtained when signals of two different frequencies are combined and rectified. The beat frequency is equal in numerical value to the difference between the original frequencies.

beat-frequency oscillator. A radio-frequency oscillator whose output is mixed with another radio-frequency signal to produce an audio frequency. Abbreviated BFO.

beat reception. The reception of radio waves by combining a received external radio wave with an internal one generated in the receiver, the combination being easier to amplify and detect. *Syn.:* heterodyne reception.

bel. Unit of relative power, named after Alexander Graham Bell, and used to express differences in power amplitudes. Usually used as 1/10 bel, termed a decibel, and abbreviated db. See decibel.

B-eliminator. An a.c. power pack which converts a.c. power line voltage to the d.c. voltages required by plate and screen grid circuits of radio tubes, thereby eliminating the need for B batteries. Often called "power supply."

bell wire. A common term for the cotton-covered B.&S. No. 18 copper wire used for making doorbell and thermostat connections in homes.

betatron. A device for imparting high speeds to electrons by causing them to move in semi-circular paths in a magnetic field.

Beverage antenna. A directional antenna consisting of a very long single conductor a few feet off the ground.

BFO. Abbreviation for beat frequency oscillator.

B-H curve. Common diagram for displaying magnetic properties of ferro-magnetic materials. Flux density (B) in gausses is plotted upward and downward; magnetic force (H) in oersteds is plotted right and left.

bias. The fixed voltages applied between grids and cathode elements of an electron tube. Called C bias when referring specifically to the control grid of the tube. Also a high-frequency alternating current which is fed into recording circuits in order to reduce distortion.

bias cell. A tiny 1½ or 1¾ volt cell used singly or in series to provide a negative C bias voltage for a vacuum tube amplifier circuit. It will last indefinitely if not shorted.

bias modulation. A system of amplitude modulation in which the modulating voltage is superimposed on the bias voltage of an RF (radio frequency) amplifier tube. Control grid, suppressor grid, and cathode modulation are types of bias modulation.

bias resistor. The cathode resistor through which plate and screen grid currents of a vacuum tube flow, developing across this resistor a DC voltage used as a C bias.

bifilar inductor. A coil wound with a length of wire doubled back on itself before winding. Thus, the turns in a bifilar inductor consist of a double wire, closed on one end of the coil and open on the other. Current flowing in any one wire of a turn is always 180° out of phase with the other wire of the turn; this phase difference substantially cancels out inductance.

bilateral antenna. An antenna having its maximum response in two diametrically opposite directions (180° apart).

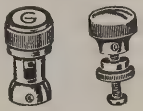
bilateral network. One in which a given current flow in either direction causes the same potential drop.

billboard array. A type of VHF antenna array consisting of stacked dipoles spaced ¼ to ¾ wavelength apart with a large sheet reflector of metal spaced behind the dipole bays.

binaural. A type of sound recording and reproduction. Two microphones, each representing one ear and spaced about 6 inches apart, are used to pick up the material to be recorded. The sound picked up by each microphone is then recorded on separate tape channels. Playback is accomplished through separate amplifiers (or a two-channel amplifier) and special headphones wired for binaural listening.

binaural effect. The effect of sound reaching both human ears by which it is possible to locate the sound source.

binding post. A terminal fixed in position and usually consisting of a threaded post to which wires may be attached by means of one or more nuts. Binding posts may be equipped with lugs or jacks.



Binding Posts

black body radiation. The distribution of heat and light which would be given off by an ideal radiating surface at any temperature. As the temperature increases, the energy emitted at every frequency is increased; the peak value shifting from the region of heat toward that of light.

blacker-than-black level. That part of the television signal used for synchronizing pulses and blanking which are transmitted at higher amplitude levels than the black level of the picture.

black level. The amplitude level of a television signal which reproduces the black portion of the picture.

black-level control. A control on a television receiver for varying the amplitude of that portion of the video signal which produces the black parts of the picture.

blanketing. A type of radio interference in which signals over a wide band of frequencies are partially reduced in amplitude or completely disappear. Blanketing often occurs when a radio receiver is located in the strong RF field of a nearby transmitter.

blanking. The cutting off of the beam in a cathode-ray tube during time when picture is not being formed. The beam is blanked while spot returns from far right to begin a new line at left or when spot travels from bottom to top of the next picture.

blanking pulse. A pulse used to accomplish blanking of the beam at both the camera and TV receiver. Accomplishes this by driving the cathode-ray tube beyond cutoff during the time the spot is returning from right to left or from the bottom to the top of the picture. Blanking pulses must be synchronized with the sweep circuits so that the beam is cut off at the right time.

blasting. Overloading of an amplifier or loudspeaker, resulting in severe distortion of loud sounds.

bleeder current. A current drawn continuously from a power pack to improve its voltage regulation or to increase the voltage drop value across a particular resistor.

bleeder resistor. A resistor which is used to draw a fixed bleeder current. Also used, as a safety measure, to discharge filter capacitors after the circuit is de-energized.

block diagram. Simplified outline of an electronic system in which circuits or parts are shown as rectangles.

blocked grid keying. A means of keying a radio telegraph transmitter in which closing the key removes the grid bias which blocks one or more tubes when key is open. While tubes are blocked no power reaches the antenna.

blocked resistance. The AC resistance of a loudspeaker when its moving elements are held immobile.

blocking. The application of extremely high negative grid bias to a vacuum tube thus reducing the plate current to zero.

blocking capacitor. Any capacitor used in a radio circuit to block the flow of direct current while allowing a.c. signals to pass.

blocking oscillator. An oscillator used to start horizontal and vertical sweep generators in a television system.

blooming. Term applied to television screen when too many electrons strike screen and increase spot size. Generally caused by insufficient high voltage.

blue gun. The electron gun in a three-gun color CRT which provides a beam striking the blue-emitting phosphor dots of the screen mosaic.

body capacity. The capacity existing between the human body and a piece of radio apparatus or ground.

bombardment. The impact on electrodes, walls or other parts within a tube by electrons or positive ions, usually at high voltage. This may cause secondary emission, may destroy sensitive surfaces, or may puncture or fuse glass. Bombardment by positive ions is occasionally used to heat and degas electrodes during exhaust of tubes. The term, in tube factory parlance, refers to induction heating for the same purpose.

boom. A movable mechanical fixture used for suspending and moving microphones.

boost. To amplify; amplification.

booster. See relay station. Also, an auxiliary amplifier associated with a receiver such as TV or FM boosters widely used in fringe areas.

boost voltage. Additional voltage supplied by the damper tube to the horizontal output and oscillator tubes and to vertical output tubes to attain greater sawtooth output.

braided wire. Flexible wire made up of small strands woven together.

brakefield oscillator. An electronic tube oscillator of the positive grid type usable to 10,000 mc. Efficiency drops off to 2 or 3% at the higher frequencies.

branch circuits. Circuits which contain junctions of three or more conductors. Examples: Circuits with two or more components in parallel, bridges, filters, etc. A branch is the path between any two junctions in the circuit.

branch windings. Forked, polyphase transformer windings.

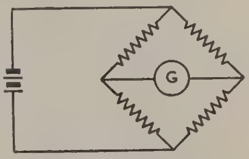
breadboard. Laboratory idiom for an experimental circuit setup exposed on a board for portability and ease of assembly or disassembly.

break-down voltage. The voltage at which the insulation between two conductors or parts will break down.

break-in operation. A type of radio communication in which the receiving operator can interrupt the transmitting operator at any time.

break-up. Incorrect colors which result from rapid motion of subjects in color TV.

bridge circuit. A mesh circuit consisting basically of six branches including one source of potential. Four of these, called arms, are connected in the form of a square; the other two are connected at the diagonals of the square. The DC Wheatstone bridge is usually diagrammed with a battery in series with four resistance arms (two parallel branches each of two resistors in series). A galvanometer is bridged across the intermediate terminals. Adjustment of the resistors to null reading of the galvanometer makes possible the determination of one of the resistors if the other three are known. AC bridges employing phones, meter or oscilloscope as the detecting device are used for the measurement of inductances or capacitances. Two of the arms are resistive. It may be necessary to balance the third or standard arm for resistance as well as reactance. There are numerous adaptations of the bridge circuit with resistance thermometers as for measuring microwave power or residual gas pressure in a vacuum. There are elaborations such as the six-arm Kelvin bridge used for determining very low resistance values. Bridge circuits in which the arms are rectifier elements are used in some AC meters; also as a source of rectified current.



Basic DC Bridge Circuit

bridge rectifier. See bridge circuit.

brightness. Intensity or degree of light produced on the screen of cathode-ray tubes.

brightness control. In a television receiver, the control which varies the average illumination of the reproduced image by varying the bias on the picture tube.

brilliance. See brightness.

brilliance control. A potentiometer used in a 3-way speaker system. Permits adjustment of output level of the tweeter (high-frequency speaker) in order to achieve proper volume relationship between the treble and lower frequencies produced by the speaker system.

broadband. Ability of a circuit or antenna to be useful over a large frequency range and maintain voltage gain or amplification over this range.

broadband amplifier. An amplifier that maintains flat response over a wide range of frequencies.

broadband antenna. A transmitting or receiving antenna that performs with approximately uniform efficiency over a very wide frequency band without the need for adjustment. Broadband antennas are very commonly used for television reception, since they will normally give good results over a number of channels. The folded dipole is a widely used type of broadband antenna.

broadband RF stage. A radio frequency amplifier that provides approximately uniform amplification over a very wide band of frequencies without the need for adjustment. Broadband RF amplifiers are frequently used to increase the sensitivity of broadcast receivers, and are incorporated in many television boosters.

broadcast. A radio transmission intended for reception by the general public.

broadcast band. The band of frequencies between 550 kc and 1600 kc, to which are assigned all standard broadcast stations operating in the United States.

broadcasting. A general term applying to the radiation of radio waves carrying programs intended for public interest, education, or entertainment.

broadside array. A parallel antenna array with all currents in phase and which radiates in a plane perpendicular to the plane of the antenna elements.

brush. A metal or carbon block used to make contact with a rotating or other moving part in an electrical circuit.

brush discharge. A luminous, hair-like electrical discharge between two or more conductors operating at high voltage, or from a conductor into space. *Syn.:* corona.

B. & S. gauge. Brown and Sharpe wire gauge, the standard gauge used in the United States to specify wire sizes.

B supply. The plate power source for vacuum tubes.

BT cut crystals. Most extensively used crystals in radio frequency transmitters from 4500 to 10,000 kc.

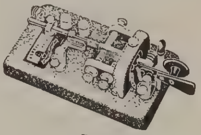
buffer. Any part or circuit used to reduce undesirable interaction between electronic circuits.

buffer amplifier. One or more stages of RF amplification used in a transmitter to build up the control crystal frequency to an appropriate level before modulation. This is to prevent feedback of undesired frequencies to the crystal.

buffer capacitor. Any capacitor connected in an electronic circuit for the purpose of reducing peak or surge voltage amplitude to protect other parts in the circuit.

buffer stage. An amplifier stage used to prevent feed-back of energy from a power stage to a preceding stage; or to prevent one stage from loading down a preceding one.

bug. A semi-automatic code transmitting key in which movement of a lever to one side produces a series of dots, and movement to the other side produces a single dash.



Bug

built-in antenna. An aerial which is an integral part of a radio or television receiver. It may be a loop aerial, a power line connection or a sheet of metal mounted in receiver cabinet. FM and television built-in antennas incorporate modified dipole principle.

bulb. Glass or metal shell of a vacuum tube. Sometimes called envelope.

bulk eraser. An AC-powered device for erasing an entire reel of tape at once without running it through the recorder. Produces a strong magnetic field to neutralize the magnetic patterns on the tape.

bunching of electrons. Application of rapidly alternating fields to a uniform beam of electrons so that their velocities will be sinusoidally modulated. The result of this modulation is that after a proper interval of travel the faster electrons have caught up with preceding slower ones and bunches are formed. Such bunches of electrons can deliver energy to a resonant cavity and are thus used in the generation of microwave power in klystrons.

bus. Term used to specify an uninsulated conductor (a bar or wire). Usually square or round; may be solid or hollow.

butterfly capacitor. A variable capacitor the plates of which roughly approximate the shape of a butterfly. Chiefly used in balanced, very high frequency circuits.

buzzer. An electromagnetic device in which attraction of an armature by an electro-magnet interrupts the current flow; a spring then pulls the armature back, closing the circuit again so that the process repeats itself and creates a buzzing sound.

BX cable. A type of 2- or 3-conductor cable having a flexible metallic covering. Used in indoor power line circuits.

by-pass capacitor. A capacitor used to provide a low-impedance path for radio or audio signals around a resistor or between a circuit terminal and ground.

B-Y signal A blue minus luminance, or blue minus Y, color TV signal. See color difference signal.

C

C (1). The letter symbol used to designate a fixed or variable capacitor in a schematic diagram. (2). Identifies the collector of a transistor. (3). Abbreviation for centigrade.

C−. (*C negative or C minus.*) Symbol used to designate the point in a vacuum tube circuit to which the negative terminal of the grid bias voltage source is to be connected.

C+. (*C positive or C plus.*) Symbol used to designate the point in a vacuum tube circuit to which the positive terminal of the grid bias voltage source is to be connected.

cabinet. The plastic, wood or metal housing in which electronic equipment is enclosed.

cabinet resonance. The acoustical vibration, at a given frequency, of an enclosure or other cabinet containing a loudspeaker or speaker system.

cable. One or more insulated or non-insulated wires used to conduct electrical current or impulses. Grouped insulated wires are called a multi-conductor cable.

Cable

cadmium. A metal, plated on metallic components such as chassis, capacitors, switch points, etc., to improve surface conductivity, provide for easy soldering, or to prevent rusting or corrosion.

caesium. See Cesium.

calibration. A method of comparing an instrument, device, or dial, with a standard to determine its accuracy, capacity or graduations; or, devising a scale.

call letters. Validly assigned identifying letters for a radio station or transmitter. Letters are assigned by the Armed Services, the FCC, and by the integral branches of the Government.

cam. An irregular-shaped rotating or sliding part employed to convert rotary motion to linear motion, or vice versa. Used in mechanical push-button tuning systems.

camera. In television, the unit housing the optical system and light-sensitive pickup tube. The camera breaks down the visual image into a large number of small picture elements, translating the light intensity of each element into its electrical equivalent.

camera tube. A light-sensitive electron tube used in television. See iconoscope and image orthicon.

candelabra base. A type of screw base employed on lamps. The size of the candelabra base is midway between that of the base on standard lamps and the miniature base on flashlight and pilot bulbs.

candlepower. A measurement of light-producing ability; luminous intensity. The standard 1-candlepower source produces a light flux of 12.57 lumens.

capacitance. The quantity of electric charge which can be received by a system of insulated conductors from a potential source of given value. The term *capacity* is often used in this connection. A capacitor does not become filled but will receive more charge with increasing potential until breakdown occurs. Unit of capacitance is the farad. A one farad capacitor requires one coulomb of charge to raise its potential one volt. A microfarad (mfd) is one one-millionth (10^{-6}) of a farad. A micromicrofarad (mmfd) is one one-millionth of a microfarad or (10^{-12}) farads.

capacitance bridge. A form of Wheatstone bridge used to make exact comparisons of capacitances.

capacitor-input filter. A type of power supply filter which changes the pulsating DC output of a power supply rectifier to pure DC. In this type of filter a capacitor across the output of the rectifier precedes an inductor or a resistor; there may be several such elements. Voltage regulation with this type of filter is not as good as when using the inductor (choke) input filter and ripple may become serious at high currents. However, capacitor input filters offer the advantage of about 55% greater output from a given voltage source than inductor input filters.

capacitive reactance. The reactance which a capacitor offers to an alternating current. It is measured in ohms, and decreases as frequency and capacity are increased.

capacitor. A radio part consisting of two conducting surfaces separated from each other by an insulating material such as air, oil, paper, glass, mica or ceramic. A capacitor is capable of storing electrical energy. In radio circuits, capacitors are used to block the flow of direct current while allowing alternating and pulsating currents to pass. The capacitance of a capacitor is specified in microfarads and micro-microfarads. The capacitance of a parallel plate capacitor in air is equal to the area of the dielectric divided by 4 pi times the thickness of the dielectric.

capacity. See capacitance.

capacity coupling. Also capacitive coupling. A type of coupling in which a capacitor provides a path for signal energy between two circuits or stages of an amplifier.

capacity-operated relay. A type of electronic relay circuit which is actuated by very small capacitance changes, such as those caused by bringing a hand near a pickup wire or plate connected to the circuit. Capacity-operated relays have many industrial applications as safety devices.

capstan. The motor spindle or shaft on a tape recorder which turns the tape reel at a constant speed.

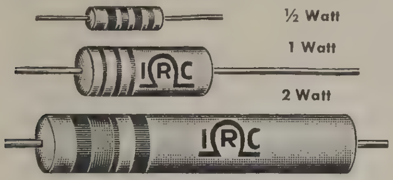
capture effect. An effect occurring in FM reception when the stronger of two stations of the same frequency completely suppresses the weaker station.

carbon. An element found as graphite or diamond, and obtained artificially as lampblack, charcoal, coke, etc. Used in resistors, potentiometers, microphones, battery electrodes, arc lamps, motor and generator brushes, etc.

carbonized filament. A thoriated tungsten filament which has been treated with carbon. A layer of tungsten carbide formed on the surface slows down the evaporation of the active emitting thorium and thus permits operation at temperatures as high as 2200° Kelvin, with much greater electron emission.

carbonized plate. An anode or other electrode in a vacuum tube which has been blackened with carbon for the purpose of increasing the heat dissipation by radiation.

carbon microphone. A type of microphone in which the pressure of sound waves against a diaphragm is transmitted mechanically to a number of carbon granules within a container, causing the resistance of the carbon granules to vary in step with the sound impressed on the diaphragm.



Carbon Resistors—Actual Size

carbon resistor. A resistor made of carbon particles and a ceramic binder molded into a cylindrical shape, with connecting leads attached to opposite ends.

carborundum. Silicon carbide. Used in crystal form to rectify or detect radio waves, as in a crystal detector.

cardioid microphone. Microphone having a heart-shaped space response pattern with a response area of about 180° in front and a minimum response in the rear.

carriage. The overhead feed mechanism of disc sound recording equipment. Part that carries the cutting head.

carrier. A current, voltage or radio wave having the assigned frequency of a radio station. When no sounds are being transmitted, such as during a pause between portions of a program, only the unmodulated carrier signal is present in the transmitting and receiving system.

carrier chrominance signal. Chrominance signal sidebands after subcarrier has been modulated by I and Q signals. Complete color information is obtained by adding the carrier chrominance signal to the monochrome (luminance, Y) signal.

carrier current. A system in which several RF waves may be sent over telephone or power lines.

carrier frequency. The frequency of the original unmodulated radio wave produced by a transmitter. In the case of a broadcast station, the carrier frequency must be maintained within a few cycles of the frequency assigned by the Federal Communications Commission.

carrier suppression. A radiotelephonic transmission system whereby the carrier wave is not transmitted or radiated. See balanced modulation.

cartridge A device used in pickup arms of phonographs or hi-fi systems to convert recorded sound material into electrical energy (see crystal cartridge, magnetic cartridge, and stereo cartridge). Also, a reel of recording tape which fits into a cartridge-loaded recorder, eliminating the necessity of threading the tape through the recording machine.

cascade. In series; as tuning circuits or amplifier stages one after another, the output of one stage connected to the input of the next.

cascode amplifier. A grounded-cathode input stage feeding a grounded-grid second stage. Used mainly in TV front-end tuners to provide good gain and low noise.

catadioptric. An optical system which utilizes both lenses and mirrors.

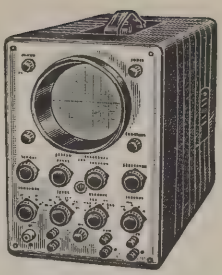
cathode. Negative or the electron-emitting electrode of a radio tube. Thermionic vacuum tubes employ heated cathodes; the heat is either supplied indirectly by a filament located inside the cathode, or is supplied by current flowing through the cathode itself. In this latter case, the cathode is also the filament. Gas tubes often employ cold cathodes.

cathode follower. A degenerative voltage feedback circuit wherein the output is taken between cathode and ground, providing high impedance input with low impedance output.

cathode keying. Method of keying a radiotelegraphic transmitter by opening the plate return lead to the cathode or filament center tap.

cathode modulation. Amplitude modulation by varying simultaneously the plate and control grid voltages, thus varying the cathode current. The actual modulating voltage is injected in the cathode lead.

cathode ray. A ray or beam of electrons from a cathode.



Cathode-Ray Oscilloscope

cathode-ray oscilloscope. A test instrument using a cathode ray tube to make visible the wave form of a varying current or voltage.

cathode-ray tube. A type of tube, funnel-shaped in general appearance, in which a beam of electrons generated in a gun structure at the apex of the tube impinges onto a fluorescent coating on the face of the tube, causing a spot of light to be emitted. Voltages applied to vertical and horizontal pairs of electrodes in the gun structure bend the electron stream, resulting in a visible pattern trace on the face of the tube. Used in oscilloscopes and television receivers. See kinescope.

cathode-ray tube screen. The fluorescent material (phosphor) that covers the inside surface of the picture end of the cathode-ray tube.

cathode-ray tuning indicator. A very small cathode-ray tube used in radio receivers to indicate when a station is tuned in accurately. Sometimes called an "electron ray tube" or "magic eye."

cathode spot. Locally heated area of mercury surface in mercury pool rectifier. This serves as source of electrons.

cation. A positive ion that moves towards the cathode in a discharge tube, electrolytic cell or similar equipment; the corresponding negative ion is called an anion.

catoptric. An optical system which uses mirrors but no lenses.

catwhisker. In radio a small, sharply pointed wire used in a crystal detector to make contact with a sensitive point on the surface of the crystal.

cavity. A metallic enclosure in some types of tubes and circuits within which resonant fields may be excited at the microwave frequency to which the cavity is tuned. This unit is usually referred to as a resonant cavity.

cavity resonance. 1. The resonant frequency of a cavity resonator. 2. The natural resonant frequency, within the audible range, of a baffle or cabinet when used with a loudspeaker. Usually unpleasant to the ear.

cavity resonator. A space enclosed by a metallic conductor and excited in such a way that it becomes a source of electro-magnetic oscillations, the size and shape determining the resonant frequency. Used in ultra high-frequency systems for which conventional types of oscillators are unsuitable.

C battery. The battery used for supplying a negative bias voltage to the control grid of a vacuum tube.

C bias. An applied voltage used to make the control grid of a vacuum tube negative with respect to the cathode.

CCS. Abbreviation for Continuous Commercial Service. Used in reference to the power rating of transformers, tubes, etc. CCS ratings are given for components used in TV and radio broadcasting stations and in various industrial applications.

cell. A single unit capable of serving as a DC voltage source. A primary cell, such as a dry cell, cannot be recharged when exhausted. A secondary cell, such as the cell of a storage battery, can be recharged when exhausted by passing a current through it in the reverse direction.

center-fed antenna. A type of transmitting or receiving antenna having a transmission line attached to its exact center. Antennas of this type are normally separated at their center point by an insulator. One conductor of a two-wire transmission line is connected to one half of the center point and the other conductor is connected to the other half of the center point. Center fed antennas using coaxial or 72-ohm twin-lead transmission line normally have an overall length of one-half wavelength. Center-fed antennas using open-wire or high-impedance twin-lead transmission line may have an overall length from one-half wavelength to any number of wavelengths depending upon the directional characteristics desired. The doublet, center-fed zepp and folded dipole are types of center-fed antennas.

centerfrequency. The assigned frequency of an FM station from which deviation takes place in step with the audio signals impressed. Also called resting frequency.

centering control. In a television receiver or oscilloscope, a control used to shift the entire reproduced image on the cathode-ray tube screen. The horizontal centering control moves the image from side to side in either direction, while the vertical control shifts the image up or down.

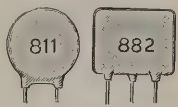
center-tap keying. A system of keying used in radiotelegraph transmitters. In this system of keying, one side of the key or keying relay is connected to the center tap of the filament transformer of the stage to be keyed and the other side is connected to B−.

center-tap modulation. A type of cathode amplitude modulation normally employed when the RF amplifier tube to be modulated does not have a cathode sleeve. In this type of cathode modulation, the modulating voltage is applied to the center-tap of the filament transformer of the RF amplifier.

ceramic. A clay-like material, consisting mainly of aluminum and magnesium oxides, which after molding and firing is used as insulation. It will withstand high temperatures and is less fragile than glass. Glazed ceramic is porcelain.

ceramic capacitor. A capacitor whose dielectric is ceramic.

ceramic cartridge. A small piezoelectric device containing a ceramic element used in phonographs and microphones to convert recorded material and sound to electrical energy. The operation of a ceramic cartridge is the same as that of a crystal cartridge, but a ceramic element rather than a Rochelle salts crystal is employed. Ceramic cartridges deliver somewhat lower output voltage than crystal cartridges. However, ceramic cartridges, unlike crystal cartridges, will not deteriorate when exposed to extremes of heat and humidity. See crystal cartridge.



Ceramic Capacitors

cesium. Chemical element having low work function. Used in cesium-oxygen-silver-photocell cathodes.

C.G.S. Centimeter-gram-second. The standard units for length, mass and time. Gradually being replaced by the MKS system, in which the units are the meter, kilogram and second.

chain. In radio, a network of radio stations connected together by special telephone lines or radio rebroadcast relay stations so that all can broadcast simultaneously a program originating at a key studio.

channel. 1. A narrow band of frequencies including the assigned carrier frequency, within which a radio or television station is required to keep its signal in order to prevent interference with stations on adjacent channels. 2. A branch or path over which signals may travel; thus, an amplifier may have several input channels, such as microphone, tuner, or phonograph.

characteristic curves. Usually a tube characteristic. A graph showing the behavior of a vacuum tube by a family of curved lines. Such curves are used to choose operating points, determine circuit constants and, in general yield a wealth of related information.

characteristic impedance. Pertaining to transmission lines. For a uniform and infinitely long line, it is the ratio of applied voltage to steady state current at a given frequency. It is measured in ohms and usually designated as Z_o. For maximum power transfer, the Z_o of a line should equal the Z_o of a source and load.

charge. Electrostatic charge is the quantity of electricity held on an insulated object or in a capacitor. When an object has more electrons than normal, it has a negative charge. When an object has less electrons than normal, it has a positive charge. The term charge also refers to energy stored in a battery in the form of chemical energy, but available as electrical energy.

charge density. Charge per unit area on a surface or charge per unit volume in space.

charger. A device used to convert alternating current into a pulsating direct current which can be used for charging a storage battery. Sometimes called a battery charger.

chassis. The metal framework on which the parts of radio, TV and other electronic circuits are mounted. Also used to designate a radio or TV receiver before it is mounted in a cabinet.

chassis punch. A tool for making round or square holes in sheet metal by means of a punch blade. A threaded shaft is inserted through a small drilled hole and the blade is forced through by tightening a nut.

Child's law. An equation that states that diode current varies directly with the three-halves power of the anode voltage, and inversely with the square of the distance between the electrodes. This is only an approximation. Also known as Langmuir's equation, or the three-halves power equation.

chirp, keying. Undesirable pitch variations occurring in radiotelegraph signals, either at the start or end of individual code characters. The resultant code somewhat resembles the chirping of a bird.

choke coil. An inductor used to limit the flow of alternating current while allowing direct current to pass. RF choke coils have air or pulverized iron cores, while AF and filter chokes have iron cores.

Choke Coil

choke-coupled modulation. See Heising modulation.

choke input filter. Network of capacitors and inductances the first member being a choke. See capacitor input filter.

Christmas tree pattern. The optical reflection from the surface of a recording. Used to determine the frequency response, roughly, by inspection. Also called optical pattern.

chroma. The quality that embraces hue (shade) and saturation of color together. A color TV term.

chroma control. In color TV, a variable resistor which controls the amount of chrominance signal fed to the demodulators. It determines the vividness of the hues in the color picture. When set to zero, the picture becomes black and white.

chromatic aberration. A lens defect that affects the sharpness of optical images by focusing light rays of different colors at slightly different points.

chromatron. A color picture tube using a single electron gun. The color phosphors are deposited on the screen in strips instead of in dots as employed in three gun tubes. All colors are fed to the single gun but each signal is gated so that only one signal is applied at a time. First red, then green, then blue. Synchronized deflection is obtained by using grid wires placed near and just in back of the phosphor strips.

chrominance. The attribute of light which produces a sensation of color apart from luminance or difference in brightness.

chrominance carrier reference. A signal with the same frequency and phase relation to the chrominance subcarrier in the color burst signal. It is used to synchronize the transmitter modulator and receiver demodulator.

chrominance channel. In color television receivers, the path or channel which is intended to recover the color-difference signals from the color subcarrier and its sidebands.

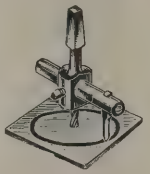
chuck. 1. A clamping device that holds stylus or needle of a phonograph pickup. 2. A device that holds a drill as in a hand drill or drill press.

circle cutter. Tool used to cut large holes in panels and chassis. Consists of a center drill with an adjustable extension arm cutter.

circuit. A path over which an electric current can flow.

circuit breaker. An electromagnetic device for opening a circuit should the current amplitude exceed a predetermined value.

circular mil. Unit of area equal to the area of a circle whose diameter is 0.001 inch or 1 mil. The area in circular mils is the square of the diameter in mils. Used chiefly in specifying cross sections of round conductors.



Circle Cutter

citizens' radio band. A band of UHF radio frequencies extending from 460 to 470 mc, allocated by the Federal Communications Commission for fixed and mobile, private or personal radio communications, radio signalling, control of objects or devices by radio, and similar applications. Maximum permissible plate power input is 50 watts. Any citizen of the United States eighteen years of age or over is eligible for a station license to operate equipment in this band.

clamper. A circuit used to reinsert the dc component of the video signal lost during amplification. Clamping circuits are also known as DC restorers.

clamp tube modulation. A type of amplitude modulation applicable to RF amplifier tubes employing a screen grid. In this system, the audio frequency signal to be transmitted is applied to a screen voltage control tube (clamp tube) which then operates as a modulator.

clamping circuit. One which keeps either amplitude extreme of a wave form at a certain potential level; *i.e.*, the process of establishing the dc level of a waveform.

Clapp oscillator. Also known as series-tuned Colpitts oscillator. A type of variable frequency oscillator noted for its very low drift characteristics.

class A amplifier. A vacuum tube amplifier in which the grid bias value is chosen for plate current operation in the center of the linear portion of the tube characteristic curve. Amplification is essentially linear, the output signal being an amplified duplicate of the input signal. *Plate current flows at all times.* To denote that grid current does not flow during any part of the input cycle, the suffix 1 may be added to the letter or letters of the class identification. The suffix 2 may be used to denote that grid current flows during some part of the cycle.

class AB amplifier. A vacuum tube amplifier in which the grid bias value is slightly higher than for class A operation. Plate current flows more than half a cycle, but less than a full cycle. The higher bias also reduces static plate current, permitting the use of higher plate voltage and resulting in higher efficiency. Class AB amplifiers are further designated as class AB_1, in which the input signal never drives the grids positive, and class AB_2, in which the grids are driven slightly positive on signal peaks.

class B amplifier. A vacuum tube amplifier, usually using two tubes in push-pull, in which the grid bias equals approximately the cut-off value of the tube so that plate current at no signal input is practically zero. Current flows during approximately half of the cycle. Class B amplifiers are used both in radio and audio frequency work. As an audio amplifier its comparative efficiency is very high.

class C amplifier. A vacuum tube amplifier in which the grid bias exceeds the cut-off bias value so that at no signal input, the plate current is zero and current flows during appreciably less than half of the cycle. The grid is always driven slightly positive on peaks. Used chiefly for radio frequency amplifiers of transmitters. Most efficient type of operation.

cleanup. Removal of gas from a vacuum tube. This may occur by getter action during flashing of the getter or subsequently; it may occur during operation of a vacuum tube by absorption in tantalum anodes which are used in part because of this property; it may occur in high voltage discharge tubes by process of gas molecules being driven into the electrodes.

click filter. Device to reduce or eliminate the key clicks in a radiotelegraph transmitter. Also termed a key-click filter.

clip. A small spring-type clamp having any of several different designs, used for making a readily removable connection to a terminal.

clipper. In television, the part of the circuit that separates the video and sync signals. See clipping.

clipping. 1. Distortion in amplifiers produced by flattening of plate current curve due to excessive grid current during positive grid swing, or due to driving the grid below cutoff. 2. Distortion in the AF component of a modulated wave when modulation amplitude exceeds that which brings the trough to zero. 3. Generation of approximately square waves by shunting biased diodes across the load, the bias determining the amplitude at which the peaks are to be clipped.

close coupling. Electromagnetic coupling in which most of the flux produced by one winding, links the turns of another winding. This is typical of iron-core transformers. The opposite is true of air-core transformers, which are said to be loosely coupled.

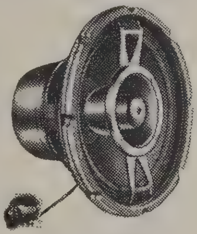
closed circuit. An electrical circuit through which current can flow, such as when a power switch is turned to the "on" position. The opposite of an "open" circuit.

closed-circuit television. Television signals which are not broadcast for reception by ordinary TV receivers. Transmission is over a closed circuit and is received only by interconnected receivers.

coaxial antenna. An antenna that consists of a ¼-wavelength extension of the center conductor of a coaxial cable, plus a ¼-wavelength sleeve connected to the outer conductor of the cable.

coaxial cable. Also coax cable or coax. A two-conductor cable in which one conductor is a flexible or non-flexible metal tube and the other is a wire centrally supported inside the tube by insulators. Also called concentric cable.

coaxial speaker. A type of speaker, designed for high-fidelity applications, which employs separate reproducing elements for the bass and treble tones. The element for reproducing the bass frequencies is called the bass cone or "woofer". The element for treble is called the "tweeter". A dividing or crossover network is also employed with speakers of this type so that high and low tones from the associated amplifier are distributed to the proper speaker element.



Coaxial Speaker

code. 1. A system of dot and dash signals used in the transmission of messages by radio or wire telegraphy. The International Morse Code (also called the Continental Code) is used universally for radio telegraphy. The American Morse Code is used commonly for wire telegraphy. 2. A system of dots and dashes, words, letters or symbols which are secret and known only to a restricted group. 3. A series of words made up of 5 letters having meanings listed in a code book, and generally used for transoceanic radio or cable communication. One of the best known is the Western Union code.

coefficient of coupling between two coils. It is that fraction of the flux produced by either coil which links the other coil. These fractions are the same.

coil. A number of turns of wire wound on an iron core, on a coil form made of insulating material, or so as to be self-supporting. A coil offers considerable opposition to the passage of alternating current but very little opposition to direct current.

coil form. The tubing or solid object on which a coil is wound. It can have any shape and can be made from any insulating material, such as paper, cardboard, fiber, bakelite, a plastic or ceramic material, or wood.

coilwinder. A manually operated or power-driven mechanism for winding coils of all types to be used in radio, television and other electronic applications.

Coil Form

cold. Idiomatic expression applied in general to electrical circuits that are disconnected from voltage supplies and at ground potential. Opposed to "hot," which means "carrying an electrical charge."

cold cathode tubes. Tubes in which no external source is used for heating the cathode. These include vacuum tubes such as photoelectric cells and rectifiers, gas glow tubes such as voltage regulators; also some gas arc tubes such as mercury pool rectifiers.

colinear array. A type of directional transmitting and receiving antenna. The collinear antenna consists of two or more driven elements which are of equal length and from 0.5 to 0.65 wavelengths long. Each element in the collinear antenna lies end-to-end in the same straight line and the current in each element is in phase.

collector rings. Slip rings on an AC generator. These rotating rings connect the armature through stationary carbon brushes to the line.

collisions. Impacts taking place between charged and uncharged particles in a gaseous discharge. They cause ionization and numerous types of energy interchange.

color balance. Adjustment of the three electron-gun emissions to compensate for the difference in the light emitting efficiencies of the three phosphors on the screen of a color picture tube.

color burst. About eight cycles of a 3.58 mc color-subcarrier frequency. These cycles are added to the horizontal-blanking pedestal of the composite color signal for synchronizing the reference oscillator in the receiver with the color carrier from the transmitter.

color carrier. The composite color TV signal.

color code. Any system of colors used to specify the electrical value of a radio part, terminals or leads. See appendix.

color decoder. A circuit in a color television receiver designed to separate the original three color signals.

color difference signal. Combining a primary color signal with the Y luminance signal so that later the addition of the Y signal produces the primary color signal alone. The combined I and Q chrominance signals in the correct polarities produce color difference signals as follows:

$-\mathrm{I}$ and $-\mathrm{Q} = \mathrm{G}\text{-}\mathrm{Y}$ (green)
$+\mathrm{I}$ and $+\mathrm{Q} = \mathrm{R}\text{-}\mathrm{Y}$ (red)
$-\mathrm{I}$ and $+\mathrm{Q} = \mathrm{B}\text{-}\mathrm{Y}$ (blue)

color dilution. A condition brought about by the mixing of color with white light, reducing its saturation.

color edging. Spurious color at the edges of different colored areas. Includes color fringing, misregistration, etc.

color fidelity. The ability of a color television system to reproduce the colors of an original scene.

color kinescope. A type of picture tube used in color television receivers. Designed to translate electrical signals into a natural color picture on a luminescent screen, which is coated with different color-emitting phosphors.

colorimetry. The science of determining and specifying colors.

color oscillator. In color TV, the receiver oscillator operating at the burst frequency of 3.58 mc. It is synchronized in frequency and phase by the transmitter master oscillator.

color phase. Phase difference between a chrominance primary signal (I or Q) and the chrominance carrier reference.

color primaries. In color television receivers, the saturated colors of definite hue and variable luminance produced by the receiver. Color primaries, when mixed in proper proportions, form other colors. The usual colors are red, blue, and green.

color purity. Freedom from mixture with white or freedom from mixture with any other color primary or primaries not already present in the desired color. See color saturation.

color saturation. The lack of dilution of a shade or hue by white. For example, the blue in the American flag is highly saturated, while that of the sky is only moderately saturated, especially in winter.

color subcarrier. The modulation sidebands of this carrier frequency are added to the monochrone signal to convey color information.

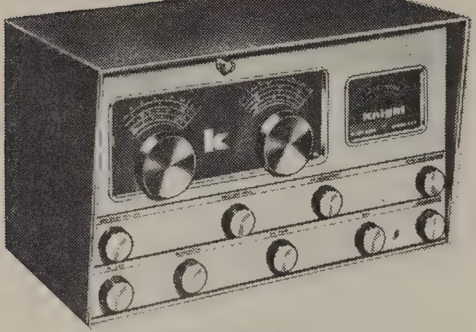
color sub-carrier frequency. In color TV, the local oscillator whose frequency is approximately 3.58 mc above the video RF carrier. This frequency is used to transmit the color signals.

color sync signal. See color burst.

color television signal. The entire signal used to transmit a full color picture. It includes horizontal, vertical and color sync signals.

Colpitts oscillator. An early and popular type of radio frequency wave generator.

combiner circuit. In color TV cameras, a circuit that combines the luminance and chroma channels with the sync signals.



Communications Receiver

communications receiver. A receiver designed especially for reception of code or voice messages transmitted by short or long wave radio communication services.

community television. A television receiving antenna system which serves the TV receivers in an entire community. Systems of this type are normally used in areas where a very elaborate and high antenna system is required to obtain signals of sufficient strength for adequate reception. Since in these areas it would often be uneconomical and impractical for individuals to install the elaborate antenna required, a single antenna is installed which distributes the received TV signals to all sets owned by subscribers to the system in the community.

commutator. A ring of copper segments, insulated from each other, connecting the armature and brushes in a motor or generator.

compatibility. Ability of color television transmission system to provide color service for modified or special color receivers and still produce monochrome pictures on existing black-white receivers without modification.

compatible color system. A color television broadcast system whose transmissions can be received in black-and-white on conventional monochrome TV receivers.

compensated amplifier. A broad band amplifier in which the frequency range is extended by choice of tubes and circuit constants. Used as video amplifiers in TV receivers.

compensated volume control. See loudness control.

complex numbers. Numbers made up by the vector addition of real numbers (ordinary numbers) and imaginary numbers (numbers multiplied by $\sqrt{-1}$ called *i* or *j*). The processes used in calculating with complex numbers can be carried over directly for use in the solution of A.C. circuit problems.

compliance. The acoustical and mechanical equivalent of capacitance. In phonograph equipment, compliance usually refers to the amount of force necessary to achieve lateral displacement of the stylus. A stiff stylus assembly results in low compliance, which can cause undue record wear. A freely moving stylus assembly is characterized by high compliance, which is desirable.

composite color signal. In color TV, the color picture signal the blanking signals and all synchronizing signals.

composite sync signal. Television term for that portion of the signal containing the horizontal, vertical, equalizing and blanking pulses.

composite television signal. The entire video, audio, blanking, equalizing and synchronizing television signal.

composite tube. A single tube which would give the same performance as two push-pull tubes. Its characteristic plate current-plate voltage curves, obtainable from the curves of the two actual tubes, would be a series of approximately straight lines.

compression. In audio systems, reducing the volume range of the input signal so that the minimum output signal has less noise, and the maximum output signal less distortion. Also used in disc recording to reduce the motion of the cutting stylus to prevent it from cutting into adjacent grooves at loud volume levels.

computer. An electronic instrument for rapidly solving extremely complex and involved mathematical problems.

concentric cable. A cable having a central conductor surrounded by a number of spirally wound conductors.

concentric groove. The final groove on a phonograph record which starts the change cycle in automatic record players. See cutoff groove.

condensations and rarefactions. Periodic increases and decreases in air pressure which result from the pulsation or vibration of some member of a sound source, string, tube, diaphragm or surface. The condensations and rarefactions traveling outward from the source constitute a sound wave, which, upon striking a sound receiver, cause it to vibrate. Sound waves, unlike radio waves, cannot be transmitted through vacuum, although they can travel through solids and liquids.

condenser. See capacitor.

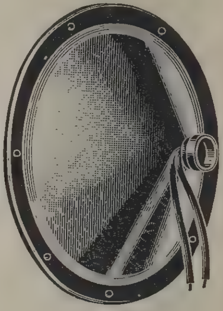
condenser microphone. A microphone operating by the change in capacitance between two plates separated by a dielectric.

Conditional Class license. A class of United States Amateur license. Holders of this license have the same privileges as holders of the General Class license. The examination for the Conditional Class license is conducted at the actual residence of the applicant or at a place more convenient than the regular FCC examining point. Persons 75 miles or more from an FCC examining point and physically disabled persons or members of the armed forces unable to appear at an examining point may take the Conditional Class examination. The examination is the same as that for the General Class license, but is conducted by two volunteer examiners.

conductance. The measure of the ability of a component to conduct electricity. In dc circuits it is simply the reciprocal of resistance. In ac circuits it is more strictly the resistance divided by the square of the impedance. Conductance is expressed in mhos. The symbol is G.

conductivity. The specific conductance of a unit specimen of a material. Reciprocal of resistivity.

conductor. A solid, liquid or gas which offers little opposition to the continuous flow of electric current.



Speaker Cone

conduit. Solid or flexible metal tube through which insulated electric wires are run.

cone (*speaker*). The conical-shaped paper or fiber diaphragm of a loudspeaker.

conelrad. A system of emergency radio broadcasting in the U.S. which minimizes the possibility of an enemy using broadcasting stations as radio navigational aids. Conelrad frequencies are 640 and 1240 kilocycles in the standard AM broadcast band. A contraction of Control of Electromagnetic Radiation.

cone resonance. The frequency at which the cone in a loudspeaker vibrates most easily. Since cone resonance results in abnormally high output at the frequency of cone resonance, it must be minimized if output at this frequency is to be essentially proportional to the other frequencies reproduced by the speaker. Cone resonance can be minimized by careful cone design and by placing the speaker in a proper enclosure.

conical horn. A loudspeaker tapered so that its cross-sectional area increases in proportion to the square of the distance from the throat.

connector. A device for electrically interconnecting one or more cables or electronic circuits. There are two main classifications of connectors; male and female. A female connector has one or more contacts, set in one or more recessed openings. The recessed opening or openings accommodate a male connector to make electrical connection. The male connector has one or more contacts extending from the connector housing. A line cord plug is a simple type of male connector; a wall electrical outlet is a simple type of female connector. Male connectors are often called plugs; female connectors are often referred to as jacks, sockets, or receptacles.

cone of silence. The area directly over a radio-beacon transmitter in which little or no signal is heard in an airplane radio receiver passing through the area.

conoscope. Device used to determine the optical axis of a quartz crystal.

console. A large cabinet for radio, TV set, or combination; designed to rest on the floor rather than on a table. Also, a type of cabinet for housing equipment in radio and TV studios.

constantan. An alloy 60% copper, 40% nickel, having a very low temperature coefficient of resistance. Coils are wound of constantan wire for use where the resistance must remain constant over wide changes of temperature.

constant-current transformer. A transformer so designed that the current at the secondary remains constant under varying loads when a constant voltage is supplied to the primary.

constant-groove speed. Pertaining to equipment for recording and playback of disc records. A term used to indicate that the linear speed of the groove with respect to the stylus is independent of the groove diameter. Special equipment is required to maintain a constant-groove speed; ordinary turntables cannot be adapted for this purpose. Usually applies to embossed records.

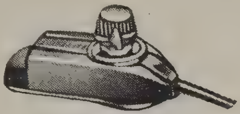
constant luminance system. A color television system which transmits all brightness (monochrome) information in the main channel and chromaticity (color) information in the subcarrier channels.

constant-voltage transformer. A transformer delivering a fixed predetermined voltage regardless of input voltage variations over a limited range (e.g., 95-125 volts).

contact EMF. A small voltage which is established whenever two conductors of different materials are brought into contact. It is due to the difference in work functions or the ease with which electrons can cross the surface boundary in the two directions. Contact EMF's cannot be used as a source of electrical energy except by employing two or more junctions at different temperatures as in a thermocouple.

contact microphone. A device used to convert mechanical vibrations into electrical voltages and currents. Used industrially and to amplify stringed musical instruments.

contactor. A device (usually a relay) for repeatedly establishing and interrupting an electric power circuit under normal conditions, *i.e.*, the part which moves and makes or breaks the circuit in response to the operation of a switch or controller.



Contact Microphone

contact resistance. The ohmic resistance between the contacts on a switch or relay. It is in fractions of an ohm.

continental code. See International Morse Code.

continuous tuner. See spiral tuner.

continuous wave. Abbreviation, CW. An unmodulated, constant-amplitude radio frequency wave.

contrast. A television term. The ratio of the white to the black portions of a picture. Pictures having high contrast have very deep blacks and brilliant whites, while a picture with low contrast has an overall gray appearance.

contrast control. In a television receiver, a manual control which adjusts the range of brightness between highlights and shadows on the reproduced image. Usually, the contrast control varies the gain of a video tube.

control grid. That electrode in a vacuum tube which has the most effective control over the plate current passed by the tube. The control grid is usually the electrode nearest to the cathode. Usually grid to which signal is applied.

convergence. In a tricolor kinescope, the meeting or crossing of the three electron beams at a common point; usually takes place at the aperture mask.

convergence control. Controls voltage applied to convergence electrode of a three-gun color picture tube. Permits proper convergence of the three electronic beams at the shadow mask.

convergence magnets. Three permanent magnets around the purity coil of a three-gun color picture tube. Used to adjust the position and direction of each beam for proper convergence at the shadow mask. They are adjusted in conjunction with the convergence control for overall convergence.

conversion efficiency. A term which applies to the mixer or converter tube in a superheterodyne receiving circuit. The conversion efficiency of a mixer or converter tube is the ratio of IF (intermediate frequency) output voltage from the plate circuit of the tube to the RF (radio frequency) signal voltage applied to the grid of the tube. High conversion efficiency is desirable.

conversion transformer. Coupling device used to connect a balanced 2-wire transmission line to a coaxial line.

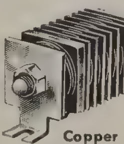
converter. That section of a superheterodyne radio receiver which changes incoming modulated r.f. signals to a lower frequency known as the intermediate frequency; the converter section includes the oscillator and the first detector. Also, a device, usually rotary, changing electrical energy from one form to another, as AC to DC, etc.

copper loss. The power lost in overcoming the resistance of conductors, transmission lines, windings of transformers, etc.

copper-oxide rectifier. A rectifier made up of discs of copper coated on one side with cuprous oxide. The discs allow current to flow in one direction but allow very little current flow in the reverse direction.

core. The center of a coil.

corner horn. A high-fidelity speaker enclosure designed for placement in a corner of the room. Enclosures of this type utilize the walls as extensions to the built-in horn and thus achieve augmented bass response.



Copper Oxide Rectifier

corner reflector antenna. A type of directive antenna often used for UHF transmitting and receiving applications. The corner reflector antenna employs two flat conducting sheets behind the driven element. These sheets are joined at an angle of 45 to 90 degrees with the driven element set at a line bisecting this angle; maximum direction of radiation is along this bisecting angle.

corona. See brush discharge.

corona effect. An electrical discharge which appears as a glow of colored light on the surface of a conductor when its potential exceeds a certain critical value. It is due to ionization of gases by high voltage. The principle of operation of corona regulator tubes, which are used as voltage regulators for potentials of the order of a few kilovolts.

cosine winding. A type of winding used in TV deflection yokes to provide uniform focusing of the picture.

cosmic rays. Rays of higher frequency than radioactive gamma rays; highly penetrating, of unknown origin, traversing interplanetary space. Cosmic rays penetrate 1½ feet of solid lead or 200 feet of water.

coulomb. The practical unit of quantity of electricity or charge. It is the charge delivered by a current of one ampere flowing for one second.

Coulomb's Law. A relation applied to electrostatics and magnetics which states that the force of attraction or repulsion between two charges (or magnetic poles), is directly proportional to the product of the charges (or pole strengths), inversely proportional to the square of the distance between them and is modified by the dielectric (permeability) of the material between them.

counter. A circuit whose output frequency is a sub-multiple of the input frequency. See frequency divider.

counter emf. A flow of current in an inductor builds up a voltage which tends to push in the opposite direction to the impressed voltage, opposing the original current flow. Also known as back electromotive force.

counterpoise. A metallic conductor array placed under a transmitting antenna and used in place of or in conjunction with the ground in an antenna system.

counting circuit. See scaling circuit.

coupling. The means by which signals are transferred from one radio circuit to another. Coupling can be direct through a conductor, electro-static through a capacitor, or inductive through a transformer. Also, a connecting device.

C power supply. Source of bias voltage for a vacuum tube.

cps. Abbreviation for "cycles per second." See cycle.

critical angle. In optics, that angle from the vertical beyond which a beam of light from below, on striking the surface of a liquid, will be totally reflected downward. In radio waves, particularly of long wavelength, a similar total reflection occurs beyond a critical angle from ionized layers in the atmosphere.

critical coupling. The closest coupling of two circuits tuned to the same frequency at which there will be only one resonant peak. See bandpass filter.

critical damping. Introduction into a series LC circuit of that value of R which will cause a transient to die out most rapidly. If R is too large the decay is too slow. If R is too small oscillations are not suppressed.

critical frequency. The highest frequency at which radio waves at any given time, when directed vertically to the ionosphere, will be reflected back to earth. The critical frequency is valuable in determining whether radio waves of a given frequency may be used for long-distance communication, since radio waves above the critical frequency are capable of "skipping" to distant locations, while radio waves below the critical frequency will not "skip". Critical frequency varies with the time of day and season of the year.

critical grid voltage. That value of voltage on the grid of a thyratron which, if increased slightly (in the positive direction), will cause the tube to fire.

critical inductance. The minimum value of inductance that will prevent the output voltage of a choke-input power supply from soaring above the average value of the rectified wave when there is minimum load on the output. Thus:

$$\text{critical inductance in henrys} = \frac{\text{load resistance (at minimum load current)}}{1000}$$

CRO. Cathode-ray oscilloscope.

cross-modulation. Interference which modulates a signal undesirably, usually from some unwanted source as an adjacent station or (in recordings) an adjacent groove.

cross neutralization. Usually accomplished in push-pull amplifiers by means of capacitors connected from the grid of each tube to the plate of the other.

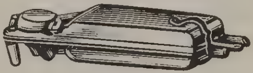
cross-over frequency. The frequency in a woofer-tweeter loudspeaker combination at which both loudspeakers receive equal power.

crossover network. Also called frequency dividing network. A frequency-discriminating, inductive-capacitive circuit used in coaxial speakers (2- or 3- unit speakers) and in multiple-speaker systems employing two or more speakers each of which is designed to reproduce specific portions of the audio spectrum. The cross-over network divides the audio frequency output of an amplifier into separate bands of frequencies which are then distributed to the appropriate speaker in the coaxial speaker or multiple-speaker system. Thus, the low frequency speaker (woofer) reproduces only the lower frequencies and the high-frequency speaker (tweeter) reproduces only higher frequencies. The frequency (or frequencies) at which the audio spectrum is separated into segments is called the cross-over frequency or cross-over point. Speaker systems or coaxial speakers employing two speakers require one cross-over point and speaker systems or coaxial speakers employing three speakers require two cross-over points.

cross-talk. A condition in color TV receivers when chrominance signals enter the luminance channel, and vice versa.

Transmitting Crystal ,Mounted In Holder

crystal. 1. A piece of natural quartz or similar piezo-electric material which has been ground to the proper size to produce natural vibrations at a desired radio frequency and to generate that frequency when set into vibration. A quartz crystal is used in radio transmitters to generate with a high degree of accuracy the assigned carrier frequency of a station and is used in crystal filters of radio receivers to improve the selectivity of the i.f. amplifier. 2. The mineral used in a crystal detector is known as a crystal.


Crystal Cartridge

crystal cartridge. A small piezoelectric device containing a Rochelle salts crystal. Used in phonographs and microphones to convert recorded material and sound to electrical energy. A crystal phonograph cartridge mounts at the end of a phonograph pickup arm and includes a stylus (needle) which rides in the grooves of a record disc. Thus, the stylus vibrates in a pattern coinciding with the pattern of the recorded grooves. These vibrations of the stylus cause varying stress on the crystal, which in turn converts this stress to electrical energy. This energy is conducted to an amplifier for amplification and transformation to audible sound. A similar crystal cartridge is used in a crystal microphone, but in this case a diaphragm is used rather than a stylus. This diaphragm vibrates in accordance with the sound picked up by the microphone and causes voltage-producing stress in the cartridge. The crystal cartridge in either phonograph or microphone is a constant-amplitude device, *i.e.*, the greater the *amount* of stylus or diaphragm movement (*not rate of movement*). the greater is the output.

crystal control. Use of a quartz crystal to maintain operation of a radio station at its assigned frequency, within the limits prescribed by law.

crystal-controlled converter. A type of radio frequency converter employing a piezoelectric crystal to establish the frequency of its oscillator. Since the oscillator frequency is fixed in this manner, converters of this type offer an extremely high order of stability. Crystal-controlled converters are widely used for the conversion of UHF and VHF signals to lower (intermediate) frequencies and also are used in the second conversion stage of some deluxe communications receivers.

crystal-controlled oscillator A type of radio-frequency oscillator employing a piezoelectric crystal to establish its operating frequency. Since the oscillating frequency is fixed in this manner, oscillators of this type provide high stability by being relatively immune to temperature and line voltage variations.

crystal-controlled transmitter. A transmitter employing a crystal-controlled oscillator to establish its frequency.

crystal cutter. A small piezoelectric device containing a Rochelle salts crystal. Used in disc recording equipment to cut grooves on a recording disc. The sound to be recorded is fed into an amplifier for transformation to electrical energy, which is in turn amplified and fed into the crystal cutter. In the crystal cutter, this electrical energy is impressed on the Rochelle salts crystal, where it is transformed to mechanical movement (piezoelectric effect) which causes a cutting needle inserted in the crystal to vibrate. These vibrations of the cutting needle coincide with the original sound source. Since the cutting needle comes in contact with the revolving record disc, a circular pattern of grooves, also coinciding with the original sound source, is cut on the recording disc. The crystal cutter is a constant-amplitude device *i.e.*, the greater the *amplitude* (not frequency) of electrical energy, the greater is the cutting needle movement.

crystal detector. A detector utilizing a crystal such as silicon or galena in contact with a pointed wire to rectify an incoming radio signal. See detector.

crystal earphone. Same as a crystal loudspeaker only applied to a smaller diaphragm in an earphone.

crystal filter. A highly selective tuning circuit employing a quartz crystal, sometimes used in the IF amplifier of a communications receiver to improve selectivity so as to permit reception of a desired station even when there is strong interference from other stations.

crystal microphone. A microphone whose output voltage is created by the deformation of a piezoelectric crystal element by sound waves.

crystal oven. An electrically heated enclosed space in which piezoelectric crystals are mounted so as to keep their temperatures constant, thus assuring freedom from frequency drift due to temperature changes.

crystal pickup. A type of phonograph pickup in which the needle movements bend or twist a Rochelle salt crystal element, causing it to generate an audio frequency voltage corresponding to the sound waves on the record.

Crystal Set

crystal set. A radio receiver which uses a crystal detector for signal rectification, and has no vacuum tubes.

CT. Abbreviation for the center tap of a coil winding. Usually applied to the windings of transformers.

CT cut crystal. A crystal cut so as to vibrate below 500 KC.

current. The movement of electrons through a conductor. Current is measured in amperes, in milliamperes and microamperes.

current amplifier. An amplifier designed to deliver an output signal primarily in the form of current rather than voltage. Typical applications are in driver amplifiers for magnetic oscillographs, recording pens and servo motors.

current feed. Process of feeding current to an antenna at point of maximum current amplitude.

current feedback. Feedback introduced in series with the input circuit as the voltage drop across an impedance which is in series with the output.

current-limiting resistor. A resistor, used in a circuit as a protective device for tubes and filter elements against overload during the warm-up period and voltage surges.

cut-off frequency. That frequency in a filter or other system at which a rapid, if not complete, attenuation takes place.

cut-off groove. The last groove on a phonograph record. Triggers the tone arm, thereby actuating the record changer mechanism.

cut-off in wave guides. The lowest frequency which a wave guide can transmit.

cut-off voltage. Negative grid bias at and beyond which plate current ceases to flow.

cutting angle. Angle between stylus and the record surface.

cutting head. That part of a sound recorder which cuts or embosses on a disc the grooves corresponding to the wave form of the sounds being recorded.

CW. Continuous wave. Also abbr. for radiotelegraphy.

cycle. One complete reversal of an alternating current, including a rise to a maximum in one direction, a return to zero, a rise to a maximum in the other direction, and another return to zero. The number of cycles occurring in one second is the frequency of an alternating current. The word cycle is commonly interpreted to mean cycles per second, in which case it is a measure of frequency.

cyclotron. Device for imparting high speeds to positive ions by causing them to move in semi-circular paths in a magnetic field.

D

D. Symbol for electrostatic flux density.

dampen. To line with sound-absorbing material so as to prevent audio echoes or reinforcement.

damping. The prevention of free swinging or vibration by some means, usually friction or resistance.

damping factor. The ratio of the nominal impedance of an amplifier, measured at a given speaker output tap, to the actual impedance at the same output tap. *E.g.*, if the output winding tap on a speaker output transformer is designed to match a speaker having an impedance of 16 ohms and if the actual impedance of the amplifier, when measured at the same tap, is two ohms the damping factor is expressed as 8:1. High damping assists a speaker in cleanly reproducing transients and permits independence of the voltage output of the amplifier from the varying load impedance of the speaker.

damping tube. In television, a vacuum tube used in horizontal sweep circuits to prevent transient oscillations. Also used to provide boost voltage for deflection purposes.

daraf. Unit of measurement for elastance, the reciprocal of capacitance. Farad, the unit of measurement for capacitance, spelled backward.

dark space. One of several regions of low visual intensity in a glow discharge. Several dark spaces may be perceptible with different configurations of electrodes at various gas pressures.

dark spot. Sometimes present in a television image and caused by malfunction at the television transmitter.

dark-spot signal. The signal existing in a television system during scanning of a dark spot by the television camera.

D'Arsonval galvanometer. A sensitive, direct-current meter made up of a coil suspended freely between the poles of a permanent magnet. Current sent through the coil causes rotation of the coil and movement of a pointer

D'Arsonval movement. The movement commonly used in precision meters for direct-current measurements.

db. Abbreviation for decibel.

db meter. A meter having a scale calibrated to read directly in decibel values at a predetermined level and used to indicate volume levels.

dc amplifier. An amplifier in which the plate of each tube is connected *directly* to the grid of the following tube.

dc. Abbreviation for direct current. Also DC.

dc component in TV circuits. A term used to designate electrically the average brightness of the scene being televised, as distinguished from the extreme highlights and shadows.

dcc wire. Abbreviation for double-cotton-covered wire.

dc generator. A rotating machine that converts mechanical energy into direct-current electrical energy.

dc inserter stage. The stage of a television transmitter that adds a DC component, known as the pedestal level, to the video signal.

dc picture transmission. Transmission of the dc component of the video signal.

dc plate resistance. The value of the DC plate voltage divided by the DC plate current of a vacuum tube.

dc receiver. A receiver designed to operate only from a dc power line, such as from the 110-volt dc lines still being used in older sections of some cities.

dc reinsertion. A circuit which keeps either amplitude extreme of a waveform at a certain potential level. Also called clamping or DC restoration.

dc resistance. The resistance (opposition to current flow) offered by a circuit or component to DC current flow. Usually called resistance, and measured in ohms.

dc restorer. Circuit used to reinsert the dc component of the video signal lost during amplification.

dc transmission. Transmission of a video signal in such a way that the direct current component of the picture signal is still present. The dc level determines the background intensity of the image. Refers also to DC power transmission.

deaccentuator. Network used in an FM receiver to compensate for the FM stations' pre-emphasis of the higher audio frequencies. Often called a de-emphasis network.

dead room. A room that is used to test various acoustical-electrical devices such as microphones, speakers, etc. Designed to have an absolute minimum of sound reflection by lining the walls, floor, and ceiling with special sound absorbing material.

dead spot. 1. A geographic location in which signals from one or more radio stations operating in a band of frequencies are received poorly or not at all. 2. A portion or spot in the tuning range of a receiver in which stations are heard poorly or not at all.

decade resistance box. A precision laboratory type of variable resistance, plug or dial operated. With the dial type, adjustment is made by a series of (commonly) four ten-position selector switches, representing, say, thousands, hundreds, tens and units of ohms. In the case of the plug type, setting is made by inserting metal plugs between metal pegs to short out unwanted resistors. In both types the resistors are usually made up of four resistance spools having relative values of 1, 2, 3 and 4 from which all required series combinations may be obtained.

Decade Resistance Box

decay curve. A type of curve applicable to radioactive decay, absorption of light or other radiation or sound or mechanical vibrations. In radio, it is useful in computing whether there will be produced triggering, relaxation oscillation, exponential pulses, damped sinusoidal oscillations, sustained sinusoidal oscillations or non-sinusoidal oscillations. The curve is defined by an expression involving ϵ with a negative exponent. Its significance is that the rate of decrease (in amplitude) is dependent on the amplitude left to decrease.

decibel. Unit of relative power, voltage or current. In electroacoustics, since the response of the ear is logarithmic (detectable change increases with level) the bel is defined as the logarithm of the ratio of the power level in question to that of the reference value. Since perhaps a tenth of this difference could be detected by the ear, a unit one-tenth as large is used: the decibel. The number of decibels is $10 \log P_2/P_1$ or $20 \log E_2/E_1$ or $20 \log I_2/I_1$. The over-all gain of a system is the sum of the decibel gains of the stages. Gains may be positive or negative. There is often a need for a unit of absolute power. The decibel is used in this sense by choosing a fixed reference value for P. In radio work, this is taken as 6 mw, chosen as the power needed to produce a barely audible 60 cycle note. 1 mw is generally used in broadcast station practice. When 1 mw is used, the gain is expressed in volume units instead of decibels to avoid confusion. In sound measurement, a zero level of 10^{-16} watts per square centimeter is chosen; the threshold of audibility at 1000 cycles.

deck switch. A gang switch in which sets of contacts are arranged at different levels on disks attached to a shaft.

decoding. In color television receivers, the process of recovering color-difference signals from the color picture signal.

decoupling. A method of isolating individual stages of an amplifier to prevent interstage feedback through common power supply circuit.

decoupling circuit. A network of one or more resistors and capacitors used to separate and bypass signals that would ordinarily flow in a common circuit and cause oscillation or "motor-boating." Used in B + of power supplies.

decrement. The decrease in the value of a variable quantity.

decremeter. An instrument for measuring decrements of rf or ac wave values.

de-emphasis. Attenuation of certain audio frequencies.

de-emphasis circuit. In FM receivers, an RC filter following the discriminator which decreases to normal proportions those high audio frequencies which, at the transmitter have been emphasized to obtain a better signal-to-noise ratio. Also used in amplifiers used for playing records, as some records (Columbia LP type, for instance) are pre-emphasized at the time of recording, for the same reason given above.

definition. The fidelity with which a television camera, television receiver, facsimile receiver, or cathode-ray oscilloscope forms an image.

deflecting coil. See electromagnetic deflection coil.

deflecting electrodes. Pair of cathode-ray tube electrodes to which a difference of potential is applied to move the electron beam in a horizontal or vertical direction.

deflection. Deliberate movement as the deflection of the pointer in a meter or the deflection of the electron beam in a cathode-ray tube.

deflection sensitivity. See sensitivity.

deflection tube. A tube whose output current is controlled by the deflection of an electron stream.

deflection yoke. A current-carrying coil or coils positioned over the neck of a cathode-ray tube to deflect the electron beam. Two sets of coils, one for horizontal and another for vertical deflection, when combined into one case, are called a deflection yoke.

degenerative feedback. Provision in a vacuum-tube-circuit for a signal to be fed back from the plate to the grid circuit to decrease the amplification. It is used in radio-frequency circuits to improve stability, and in audio-frequency circuits to reduce distortion and noise. Also called inverse feedback, negative feedback and stabilized feedback.

de-ionization. Recombination of ions in a glow or arc to form neutral atoms and molecules. Process occurs continuously during operation but the term usually refers to the instant when operation stops.

de-ionization time. The time required for the grid to regain control in a gas-filled tube (as a thyratron), after plate current has ceased.

delay. In electronics, the time required for a signal to pass through conducting media.

delay distortion. See phase distortion.

delay lines. Used in color TV receivers to equalize for phase differences caused by filters in separating the I, Y and Q signals from the composite video signal. They are inserted in the luminance channel and delay the Y signal approximately 0.6 microseconds.

delay relay. A relay designed to provide a pre-determined time delay between the instant of energizing or de-energizing and the opening or closing of the relay contacts. Also called "time delay relay".

delay screen. A fluorescent screen, used in cathode-ray tubes, which has the property of phosphorescence. When this type of screen is used, the light intensity of any particular spot dies out gradually after the ray moves to a new position. Usually called a long-persistence screen.

delayed automatic volume control. Abbreviated d.a.v.c. An automatic-volume-control circuit biased to act only on signals above a certain amplitude. It thus permits reception of weak signals without making them weaker.

Dellinger effect. A type of fade-out which occurs during short-wave reception. It is believed to be caused by rapid shifting of ionosphere layers during solar eruptions.

delta antenna matching transformer. A method of matching an open-wire transmission line to a half-wave antenna by spreading out the upper ends of the line and connecting them directly to the antenna to form a triangle like the Greek letter delta Δ. The antenna is not cut at its center.

delta connection. Connection that actually forms a triangle like the Greek letter delta Δ, as in polyphase windings.

demodulation. The reverse of modulation. The process of extracting the audio or video frequency component from the modulated RF signal. Commonly called detection (for example, the function of the second detector in a superheterodyne radio receiver).

detection. See demodulation.

detector. Commonly, the stage or circuit in a radio set that demodulates the RF signal into its audio or video component. Generally, a device or circuit that changes the form of a received radiation into a more usable form for the purpose desired (such as visual or aural indication, frequency conversion, demodulation, etc.).

detent. Mechanism used on indexed rotary switches to hold switch firmly in each position. Generally consists of a spring-loaded ball which falls into place in notches or indentations on a plate that rotates with the switch shaft.

deuteron. A particle found in the nuclei of atoms. It is composed of one proton and one neutron. The nucleus of deuterium or heavy hydrogen.

deviation ratio. An index describing FM waves. It is the ratio of maximum frequency deviation to highest audio frequency.

dial. A mechanical device for indicating on a scale the value to which a pointer or knob is set, either electrically or mechanically. Tuning dials on radio receivers indicate the station frequency to which the receiver is tuned. Test instrument and panel meter dials indicate the value of the current, voltage, resistance or power, etc.

dial cable. The braided cord or flexible wire cable used to make a tuning knob control the position of the pointer or dial which indicates the frequency to which a radio receiver is tuned.

dial lamp. The pilot lamp which illuminates the tuning dial of a radio receiver.

diamond antenna. See rhombic antenna.

diamond stylus. A diamond-tip needle, used in either cutting of master records, or the playback of records. Diamond styli are characterized by their ability to retain their tip shape, thereby cutting replacement costs and greatly reducing wear on the record grooves.

diaphragm. A thin, flexible sheet which vibrates when struck by sound waves, as in a microphone; or which produces sound waves when moved back and forth at an audio rate, as in a headphone or loudspeaker.

Dial Lamp

diathermy. A "heating through." In medical parlance, the raising of temperature or heating in tissues beneath the skin by means of high-frequency electrical oscillations. Also, the current so used, or the *machine* for applying it.

diathermy interference. A source of television interference characterized by a herringbone-patterned streak across the viewing screen, caused by spurious radiation from a diathermy machine.

dichroic mirror. A glass surface treated with metallic salts which exhibits the property of reflecting only one color and transmitting all others. Used in color TV cameras.

dielectric. The insulating material between the plates of a capacitor or adjacent wires in a cable, or between any two parts of an electronic circuit; generally air, mica, paper, oil, cloth, ceramic, or glass.

dielectric constant. The relative permittivity of the dielectric material as compared to vacuum. It is measured by determining how many times greater the capacitance of a capacitor is with the dielectric between the plates than with air. Transformer oil has a dielectric constant of about 2; mica, of 5-6.

dielectric heating. Process by which a non-conductive material is heated by using it as a dielectric in a high-frequency field. Heat is then evenly generated throughout the mass. This method of heating is currently used in some phases of plywood processing, plastics, etc.

dielectric loss. Energy loss in the dielectric of a capacitor due to hysteresis effects. The losses show up as heat. The effects are analogous to magnetic losses in steels. Heating of the dielectric increases the power factor, which in turn increases the heat losses. See hysteresis loss.

dielectric strength. The maximum voltage that a dielectric can withstand without rupture. Also called insulating strength. Expressed in volts per mm. The dielectric strength of air is 4,000, oil 16,000 and mica 50,000.

differential microphone. See double-button carbon microphone.

differentiating circuit. A circuit in which the voltage amplitude at the output is proportional at any instant to the *rate of change* of voltage amplitude at the input.

diffraction. The bending of waves (light, sound or radio) around the edges of obstacles. Effect is pronounced when obstacle size is not large compared with wavelength. Long wavelength radio waves are diffracted extensively. High frequency waves are diffracted enough to lengthen line-of-sight transmission considerably.

dig-in angle. A stylus cutting angle such that the point is driving into the disc. It is the opposite of drag angle.

diheptal base. A 14-pin tube base used for cathode-ray tubes.

dilution. Reducing color intensity by mixing with white light. See color saturation.

diode. A component having two electrodes, one being the cathode and the other the plate or anode. A diode allows electrons to pass in only one direction, from the cathode to the anode.

diode detector. A diode used in a demodulation circuit. Detection may be half or full wave rectification.

diode peak detector. A diode vacuum tube circuit used to indicate when audio peaks at the transmitter equal or exceed a predetermined value.

diode-pentode. A diode and a pentode in the same tube envelope.

diode rectifier. Any vacuum, glow or arc tube; with cold or hot cathode; operated half or full wave or poly phase; from microwatts to kilowatts output; if used with only two elements in phase and if these elements differ. Also crystals and other dissimilar contact units.

diode-triode. A diode and a triode in the same tube envelope.

dip. The angle at which a magnetic needle points toward the earth's center. Also a term used to describe the adjustment of a transmitter's RF amplifier stage to resonance.

diplexer. In television, a coupling unit permitting two transmitters to operate simultaneously or separately into the same antenna.

dipole antenna. A conductor one-half wavelength long at a given frequency. The most common form of the dipole antenna is separated exactly at the center by an insulator. Conductors of a balanced transmission line connect to the dipole sections at the insulator. Radiation resistance at the center ranges from about 60-70 ohms, depending upon height.

direct coupling. The use of a conductor to connect two amplifier stages together and provide a direct path for signal currents. Unlike capacity coupling, permits dc signal component to pass between stages.

direct current. An electric current which flows in only one direction.

direct current amplifier. A current amplifier in which the stages are direct-coupled. Operates down to 0 frequency. Used for operation of relays, photocells, medical applications. Only two, or at most three stages, may be used with a single power supply. Amplifications of 10^8 are commonly attainable.

directional antenna. Any antenna which picks up or radiates signals better in one direction than another.

direction finder. A special type of radio receiver employing a highly directional loop antenna so as to permit determining the direction from which radio waves are arriving.

directly heated cathode. A filament cathode that carries its own heating current.

director. An auxiliary antenna element located in front of the radiating or main receiving antenna element so that radiation or reception will be strengthened or improved in the forward direction.

direct radiator. A loudspeaker without a horn.

direct resistance-coupled amplifier. An amplifier in which the plate of one stage is connected either directly or through a resistor to the control grid of the next stage, with the plate load resistor being common to both stages.

direct-view receiver. Any television receiver where the picture is seen on the face of the cathode-ray tube, in contrast to reflection-type receivers where the picture is viewed on a mirror, or projection types where the picture is thrown on a screen.

direct wave. A radio wave that travels directly from transmitting antenna to receiving antenna without being reflected or refracted.

disc. A phonograph record or the blank used in a sound recorder.

disc capacitor. A small, thin, disc-shaped capacitor with radial leads.

discharge. 1. Converting the chemical energy of a battery into electrical energy by allowing the battery to send current through a circuit. 2. Releasing the energy stored in a capacitor by shorting the capacitor terminals. Also glows, arcs, sparks or corona which occur through gases or vapors at, below, or above atmospheric pressure.

discharge tube. Any device that contains a gas or vapor at low pressure and through which current will flow when sufficient voltage is applied.

discriminator. Component part of an FM receiver, which converts frequency modulated signals into audio signals.

dish (colloq.). A parabolic-shaped reflector, used to transmit or receive the radio energy in a microwave relay system.

dispersion. 1. The separation of a beam of light into its various color components; for example, by a prism. 2. The separation of a beam of microwave radiation into its separate frequencies by dielectric lenses, raindrops, etc. 3. The distribution of sound from a loudspeaker or trumpet; usually expressed in terms of the *angle* of sound coverage.

displacement current. A current which exists in addition to ordinary conduction current in AC circuits. It is proportional to the rate of change of the electric field and is unimportant at low frequencies. At frequencies above a hundred megacycles, it becomes quite significant.

displacement flux density. The electrical analog equivalent of magnetic flux density. It is the product of dielectric constant and electric field strength.

dissector tube. A cathode-ray television camera tube in which the photo-electrons are moved over a pick-up aperture by deflection circuits. Developed by P. T. Farnsworth.

dissipation. Unusable or lost energy, as the production of unused heat in a circuit.

distortion. Unfaithful reproduction of audio or video signals due to changes occurring in the wave form of the original signal, somewhere in the course it takes through the transmitting and receiving system. Classified as nonlinear, frequency, and phase distortion.

distress frequency. The frequency allotted to distress calls, generally, by international agreement. For ships at sea and aircraft over the sea, it is 500 kilocycles.

distress signal. By code: SOS; by radiotelephone: "Mayday", from the French, "M'aidez", meaning help me.

distributed capacitance. Capacitance distributed between wires, between parts, or between conducting elements themselves or between the elements and ground, as distinguished from capacitance concentrated or lumped in a capacitor. Usually applied to the capacitance between the turns of a coil.

distributed inductance. The inductance that exists along the length of a conductor, as distinguished from inductance concentrated or lumped in a coil.

distribution control. The television receiver control that varies the amount of correction applied to the saw-tooth scanning wave in order to provide linear scanning of lines.

diversity reception. Reception of radio signals by means of two or more antennas separated by several wavelengths or differing in polarity to overcome fading. Requires a special receiver.

dividing network. A sound reproducing system designed so that low audio frequencies are delivered to a large cone loudspeaker (woofer), while the high frequencies are delivered to a high-frequency loudspeaker (tweeter). The frequency at which the power delivered to both loudspeakers is equal, is termed the crossover frequency.

dominant wavelength of a color. The single wavelength of light which is dominant in any particular color.

doorknob tube. A doorknob-shaped tube designed for ultra-high-frequency work.

Doppler effect. The apparent change in the frequency of a sound or radio wave reaching an observer, due either to motion of the source toward or away from the observer, to motion of the observer, or both.

dot generator. A tester which produces a dot pattern on the screen of color picture tubes. Used to adjust the convergence controls.

dot interlacing. In color television, a method of placing dots of colors on a television screen to form the complete picture. During the first scanning of each color, the dots are separated by approximately their own width, and on the following scan of the same color, the dots are placed to fill the spaces in between.

Dot Generator

double-button carbon microphone. A carbon microphone employing two buttons or containers for carbon granules, one on each side of the diaphragm, so as to secure a push-pull action which gives increased signal output and decreased distortion.

double diode. Two diodes in the same tube envelope. Also called duodiode.

double-grid tube. A tube having two grids. A tetrode.

double-hump resonance. A condition where two different frequencies yield resonance in two closely coupled circuits.

double modulation. A method of modulation in which a carrier wave is first modulated with the desired intelligence, and the resulting modulated wave is then used to modulate a second carrier having a different frequency.

double-pole switch. A switch which simultaneously opens or closes two separate circuits or both sides of the same circuit.

doubler. In a transmitter a circuit in which the output is tuned to twice the frequency of the input circuit. Also used for doubling the voltage in power supplies.

double regeneration. Regeneration applied simultaneously to a detector and one or more preceding R.F. stages.

double side-band transmission. Transmission of the sum and difference frequencies of the modulating and carrier signals. It is the standard broadcast type of transmission.

double superheterodyne. A superheterodyne receiver using two first detector stages and two IF frequencies.

doublet antenna. An antenna composed of two elements usually strung in a straight line and connected at the middle to a single insulator, each element being some definite fraction or whole of the desired wavelength to be covered by the antenna. The elements need not be equal.

double-throw switch. A switch which connects one set of terminals to either of two other sets of terminals.

double triode. Two triodes in the same tube envelope. Also called duotriode.

down lead. The conductor that connects an antenna with a transmitter or receiver. Usually called lead-in.

downward modulation. An abnormal type of amplitude modulation. When downward modulation occurs the amplitude of the transmitter signal varies inversely with the level of the sound to be transmitted. Inadequate grid excitation of the modulated RF amplifier stage and poor voltage regulation in a power supply common to both the modulated RF amplifier and modulator will frequently cause downward modulation.

d.p.d.t. Double pole, double throw; as a switch.

d.p.s.t. Double pole, single throw; as a switch.

drag angle. Stylus cutting angle such that the point drags during recording instead of being at 90 degrees to the record surface. It is the opposite of dig-in angle.

drain. A term used to indicate that current is being taken from a voltage source.

D Region. An absorbing layer of the ionosphere at a height of about 35 miles. The ionization of this layer is greatest during the summer months at noon; however, it also exists in the winter months during periods of high solar activity. During mid-day this layer causes high absorption of low-frequency and medium-shortwave signals. The D layer disappears completely at night.

drift. A term applied to any shifting of a station's signal from the original dial setting. This shifting may be the result of frequency instability in either the transmitter or the receiver. Also applied to any gradual, unintentional deviation of a quantity, such as voltage or current, from its desired value.

drive belt. A belt used to transmit power from the driving motor to the driven device.

drive control. In television receivers, an adjustment usually at rear of the set that controls the output of the horizontal oscillator into the horizontal output tube.

drive holes. Holes spaced around the center hole of a recording disk to engage a drive pin in the turntable, preventing the disk from slipping during recording.

driven element. Any antenna array element that receives power directly from the transmitter or is connected directly to the receiver.

drive pin. A projecting rod positioned near the center pin of a phonograph used with a two or more hole phonograph disc to prevent the record from slipping on the turntable during recording.

driver. 1. That portion of a projection-type speaker (trumpet) or horn-loaded tweeter (high-frequency speaker) that contains the magnet, voice coil, diaphragm and coupling chamber. 2. A woofer (low-frequency speaker) is sometimes called a driver. 3. That portion of an audio-frequency or radio-frequency amplifier used to provide grid excitation for the power output stage.

driver stage. The amplifier stage preceding the high-power audio frequency or radio frequency output stage; there may be more than one driver stage.

driver tube. The tube used in a driver stage.

driving point impedance detector. A detector using non-linear voltage and current relations at the same terminals; *e.g.*, diode detector, grid detector, copper oxide rectifier, etc.

drop. Voltage drop, as that due to current flow through an electronic component.

dropping resistor. A resistor used to decrease the voltage in a circuit, or from across which a potential difference (voltage) is taken.

dry cell. A type of primary cell in which the electrolyte is in the form of a paste rather than a liquid. Dry cells are used extensively in radio batteries.

dry-disc rectifier. Dry contact rectifier. A rectifier consisting of discs of metal and other material in contact under pressure, such as a copper-oxide rectifier or a selenium rectifier. Passes current only in one direction.

Dry Cells

dry electrolytic capacitor. An electrolytic capacitor in which the electrolyte is a paste rather than a liquid.

dsc wire. Abbreviation for double-silk-covered wire.

DT cut crystal. Crystal cut so as to vibrate below 500 KC.

dual capacitor. Two capacitors in a single housing.

Dry-Disc Rectifier

dual-diversity receiver. A radio receiver designed to receive signals from two different receiving antennas and using whichever signal is the stronger at each instant, in order to offset fading. A form of diversity receiver.

dual modulation. The process of modulating a carrier wave with two different modulations, as for example, amplitude and frequency modulation, so as to transmit two different types of intelligence or two messages on one radio channel.

dual-track recording head. A magnetic recording head which records on half the width of the recording tape. By inverting the tape, a second track can be recorded on the other half of the tape.

dubbing. Tape, wire or disc recording from an original source.

dummy antenna. A resistor or other device which duplicates the electrical characteristics of a transmitting antenna without radiating radio waves. Used for testing and adjusting transmitters.

duodiode. Two diodes in the same tube envelope. Also called double diode.

duo diode-pentode. Two diodes and a pentode in the same tube envelope.

duo diode-triode. Two diodes and a triode in the same tube envelope.

duo triode. Two triodes in the same tube envelope. Also called double triode.

duplex operation. The operation of associated transmitting and receiving equipment at will without interruption. Most land telephonic wire communication is duplex.

duralumin. An alloy of aluminum which is comparable in strength and hardness to soft steel. It contains 95.5 parts aluminum, 3 parts copper, 1 part manganese and .5 part magnesium.

dust core. A pulverized core for use in transformers consisting of iron particles mixed with a binding material or matrix.

DX. Code or radiotelephonic colloquialism for word "distance," the "X" taking the place of the letters after the D. Similarly WX is weather and CX is conditions, etc. DX refers to distant reception of radio signals.

dynamic characteristics. Tube characteristic curves which take into effect the operating conditions, *i.e.*, the presence of a plate resistor. Dynamic characteristics may be derived from static characteristics and the load line.

dynamic convergence. In color TV, the coming together of the beams at openings away from the center of the shadow mask.

dynamic demonstrator. A schematic diagram, or model of a working circuit, having all parts mounted on an upright board or on a table. Used extensively in radio-television training schools for "live" demonstrations.

dynamic focus. The focus attained under operating conditions (during scanning) in a color television receiver.

dynamic loudspeaker. A loudspeaker in which the coil carrying the audio-frequency current is attached to a moving diaphragm or cone, and moves in and out in a constant magnetic field produced either by a permanent magnet (PM dynamic loudspeaker) or by an electromagnet or field coil (electrodynamic loudspeaker). Also called moving-coil loudspeaker.

dynamic microphone. A microphone in which the flexible diaphragm is attached directly to a coil positioned in the fixed magnetic field of a permanent magnet. Sound waves move the diaphragm, causing the attached voice coil to move with respect to the magnetic field, and thereby inducing the desired audio-frequency voltage in the coil. Sometimes called moving-coil microphone.

dynamic noise suppressor. Circuit for audio amplifiers, especially those for record players. The frequency response at both ends is continually adjusted by reactance tubes so that low or high frequency noise is blocked unless the amplitude level at these frequencies is sufficient to provide a satisfactory signal-to-noise ratio.

dynamic range. The ratio between the softest and loudest sounds which can be recorded, or reproduced by an amplifier or speaker, without distortion.

dynamic sideband regulation. Abbreviated DSR. A development in FM tuner circuit design, first introduced in a Knight high-fidelity FM tuner. DSR regulates the deviation of incoming FM signals in order to reduce distortion caused by weak signal level or by overmodulation at the station.

dynamo. A machine for converting mechanical energy into electrical energy. It may also be used as an electric motor by applying a suitable voltage to its terminals. The term dynamo more often applies to a DC generator, while the word alternator applies to an AC generator.

dynamometer-type harmonic analyzer. A circuit in which a complex input voltage is examined by amplification and feeding into one coil of a dynamometer. A variable frequency oscillator output is fed into the other coil. Presence of harmonics is detected by adjusting the oscillator frequency to values very close to them in order to produce slow oscillations of the meter needle.

dynamotor. A rotary voltage converter in which usually two windings are used on the rotor and one of the stator. The two rotor windings terminate in separate commutator and brush sets. Generally used to convert a low DC voltage to a high DC voltage as for mobile transmitters, amplifiers, etc. Also known as genemotor.

Dynamotor

dynatron. A four-electrode vacuum tube so designed that secondary emission of electrons from the plate causes the plate current to decrease as plate voltage is increased, giving a negative resistance characteristic. Used in oscillator circuits.

dyne. The unit of force in the cgs system. It is that force which will give an acceleration of one centimeter per second during each second to a free mass of one gram.

dyne per square centimeter. The unit of sound pressure. One dyne per square centimeter was originally called a bar in acoustics, but the full expression is used today in this field because in other applications a bar is 1,000,000 dynes per square centimeter.

dynode. One of the secondary emitting electrodes in an electron multiplier tube.

E

E. Symbol used for voltage. Also written e.

E_b-E_y. A color television signal which is the result of subtracting E_y from the original full blue signal. See E_y.

E_g. Symbol for grid bias voltage.

E_p. Symbol for dc plate voltage.

E_{sg}. Symbol for dc screen grid voltage.

earphone. See headphone.

e.c. Abbreviation for enamel covered wire.

eccentric circle. A blank endless groove cut non-concentrically at the inside of some phonograph records to actuate the tripping mechanism of an automatic record changer.

echo. Simultaneous reception of a radio signal and the part of it which was transmitted approximately 1/7 of a second earlier and has circled the earth. The characteristic "hollow" sound, or echo, is produced because of the very small time interval involved.

echo area. The effective scattering cross-section area of a radar target.

echo chamber. A reverberant room, enclosure or box, used in radio studios to create hollow effects or actual echoes for radio programs.

ECO. Abbreviation for electron-coupled oscillator.

eddy currents. Circulating currents induced in conducting materials by varying magnetic fields. They are usually undesirable because they represent loss of energy and cause heating.

Edison base. The standard screw base used for ordinary electric light bulbs in this country.

Edison effect. The emission of electrons from a heated electrode. Discovered by Edison when a current flow was detected between the filament of an incandescent lamp and an auxiliary electrode placed in the bulb. Also referred to as Richardson effect or thermionic emission.

Edison storage cell. A storage-type cell having iron oxide negative plates and nickel oxide positive plates immersed in an alkaline solution.

effective antenna length. The electrical length of an antenna as distinguished from its physical length.

effective current. That value of alternating current which will cause the same heating effect as a given value of direct current. For sine wave alternating currents, the effective value is 0.7071 times the peak value.

effective height. 1. The true electrical height of an antenna corresponding to a "perfect" antenna that will produce the same field strength. 2. The virtual height of an ionized layer of the ionosphere.

effective resistance. The average power dissipated divided by the square of the effective current in an AC circuit.

effective signal radiated. The rating basis for licensing non-amateur radio transmitters. Equal to the square root of the effective radiated power times the antenna height in feet above the ground level.

efficiency. The ratio of energy output to energy input, usually expressed as a percentage. A perfect electrical device would have an efficiency of 100%.

efficiency of rectification. The ratio of the DC power output to the AC power input of a rectifier.

E layer. An ionized layer in the E region of the ionosphere.

EIA. Abbreviation for Electronics Industries Association. Formerly known as RETMA (Radio-Electronics-Television Manufacturers' Association).

Electralloy. An alloy frequently used to make radio chassis. It is characterized by having non-magnetic properties.

electrical angle. A means of specifying a particular instant in an alternating-current cycle. One cycle is considered equal to 360 degrees, hence a half cycle is 180 degrees and a quarter cycle is 90 degrees.

electrical bandspread. The use of a small variable capacitor in parallel or series with the tuning capacitor in a receiver. Used to spread the normally crowded stations over a greater linear tuning range of a dial and thereby obtain more accurate and easier tuning.

electrical center. That point approximately midway between the ends of an inductor or resistor which divides it into two equal electrical values, as to voltage, resistance, inductance, or number of turns.

electrical degree. One 360th of a cycle of an alternating current or voltage.

electrical inertia. Inductance; opposing any change in current flow.

electrical modulation. In facsimile, the method by which the carrier is introduced into an electrical modulator.

electrical radian. One 2πth (1/6.28 of a cycle) of alternating current or voltage.

Electric Eye

electric eye. A photoelectric circuit. A cell or vacuum tube having electrical properties which are modified by the action of light; e.g., one that uses photoelectric effect to produce an electric current.

electric field. A region in space in which a charge experiences a force. Example: region surrounding a charged object. Field strength or field intensity is defined as the force per unit charge placed in the region as a test charge. Direction of the field is that direction in which a free positive charge would move. Lines drawn in these directions are called lines of force. Density of these lines indicates at each point the strength of the field. A varying electric field is associated with a varying magnetic field as with radio waves or accelerated electrons. Uniformly moving electrons produce a constant magnetic field as with electrons flowing in a conductor.

electricity. The flow of electrons in or on a conductor, or through a gas or space as in a vacuum tube.

electric sheets. Sheet steel used for laminated magnetic circuit elements such as coils or transformer cores.

electric tuning (push-button). A device for automatically tuning a radio receiver to a desired station by pressing a button. For example, button may connect a set of pre-adjusted trimmer capacitors into receiver tuning circuits.

electro-acoustic. Pertaining to a device whose functions involve both electric current and sound frequency pressures. A loudspeaker and a microphone are examples.

electrode. 1. One of the essential components inside a vacuum tube, such as the cathode, plate, or the various grids. 2. One of the plates of a dry or wet battery. 3. One of the plates of an electrolytic capacitor. 4. One of the carbons of an arc lamp or furnace.

electrode capacitance. The capacitance between one electrode and all the other electrodes connected together.

electrode potential. The voltage appearing at an electrode, usually with respect to the cathode of a vacuum tube.

electrodynamic instrument. A meter that measures power, voltage or current by means of a fixed and a movable coil. Used chiefly for measuring alternating current. Also called electrodynamometer.

electrodynamic loudspeaker. A dynamic or moving coil loudspeaker in which the fixed magnetic field is created by an electromagnet called the field coil.

electrolysis. The production of chemical changes by passing current through an electrolyte. Common uses: electroplating, electroforming, electropolishing.

electrolyte. The liquid, chemical paste, or other conducting medium used between the electrodes of a dry cell, storage cell, electrolytic rectifier, electrolytic capacitor.

electrolytic cell. A cell consisting of a conducting liquid (electrolyte) and two electrodes of identical composition. Such a cell cannot serve as a source of electrical energy, but can conduct current from an outside source (electrolytic action). Used in electroplating, electroforming, production of gases and accomplishment of many industrial processes such as refinement of metals. If, as a result of current flow the electrodes become dissimilar, voltaic action becomes possible.

Electrolytic Capacitor

electrolytic capacitor. A fixed capacitor in which the dielectric is a thin film of gas formed on the surface of an aluminum electrode by a liquid or paste electrolyte.

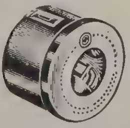
electrolytic rectifier. A rectifier consisting of metal electrodes immersed in a suitable solution permitting the passage of current in one direction more readily than the other.

electrolytic tank. A large insulated tank containing salt solution. Used for the design of tube elements. Large scale outlines of bent metal are investigated by applying potentials between them and searching out equipotentials with probes. Phones or scopes are used as detectors.

electromagnet. A coil of wire, usually wound on an iron core, which produces a strong magnetic field when current is sent through the coil.

electromagnetic deflection. The process of bending or changing the path of an electron stream by means of a magnetic field. The field is usually created by the passage of current through deflection coils. See deflection yoke.

electromagnetic energy. Energy in a radio wave made up of electrical and magnetic components.



Electromagnetic Deflection Coil

electromagnetic deflection coil. In television, a current-carrying coil positioned over the neck of the cathode-ray tube to deflect the electron beam. Two sets of coils, one for horizontal and another for vertical deflection, when combined into one case, are called a yoke.

electromagnetic field. A magnetic field located at right angles both to the lines of force and to their direction of motion.

electromagnetic spectrum. Total range of frequencies of electromagnetic waves. Also see radio spectrum, a part of the electromagnetic spectrum.

Type of Wave	*Wavelength*
Radio	Above 1000 km to below .1 cm
Infra red (heat rays)	.03 cm to .000076 cm
Visible light	.000076 cm to .000040 cm
Ultra violet	.000040 cm to .0000013 cm
X-rays	10^{-6} cm to 10^{-9} cm
Gamma rays	10^{-8} cm to $5x10^{-11}$ cm
Cosmic rays	10^{-11} cm to 10^{-12} cm

electromagnetic units. A system of units derived from the interaction of a current and a magnetic field. The absolute cgs system of units. The practical system is derived from the absolute system by multiplying by powers of ten.

electromagnetic waves. Radiation taking many different forms and exhibiting widely differing properties, but all having in common the characteristic of velocity in the order of $3x10^{10}$ cm/sec. Long wavelength radiations (radio waves) are characterized by reflection and refraction properties similar to light, and by their ability to generate an electric current in a conductor. They consist of electric and magnetic fields perpendicular to each other and to the line of travel. As wavelength decreases, the radiations act less like waves and more like energy particles, but never fully lose wave characteristics.

electromagnetism. Magnetic effects produced by currents rather than by permanent magnets.

electromotive force. Voltage; the force which causes current to flow in a circuit. Particularly the no-load voltage of a generator or cell.

electron. The elementary charge of negative electricity. The mass is $9.1x10^{-28}$ grams. The charge is $—1.6x10^{-19}$ coulombs. The diameter is of the order of 10^{-13} cm.

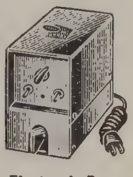
electron-beam generator. A velocity-modulated generator, such as a klystron tube, used to produce extremely high frequency waves.

electron-coupled oscillator. An oscillator circuit employing a screen-grid tube so connected that its input and output are internally connected by the stream of electrons from the cathode.

electron coupling. A process of coupling two circuits through a vacuum tube, principally multigrid tubes. The electron stream between electrodes in one circuit transfers energy to electrodes in the other circuit.

electron emission. The ejection of electrons from the surface of a material into surrounding space under the influence of heat, light, high voltage, or any other cause.

electron gun. Tube electrodes designed for the production of a narrow beam of electrons intended for use in fluorescent screen or microwave tubes. A common type of gun used in cathode ray tubes consists of a cathode and three concentric, end to end cylinders called the grid and first and second anodes. Grid and first anode contain washer-like discs which restrict the beam. Potentials are adjusted to focus the electron stream.



Electronic Bug

electronic bug. A code transmitting key employing electronic circuits for automatically producing both dots and dashes. Movement of its operating lever to the left produces any required number of dashes; movement of the lever to the right produces any required number of dots.

electronic commutator. A switching arrangement composed of electron tubes and circuits used to connect circuits in rapid succession.

electronic control. The control of a machine or device by apparatus employing electron tubes.

electronic heating. Use of radio frequency energy to heat non-metallic materials such as wood, plastics, etc. Heat is produced by molecular friction. Metallic materials are heated electronically by eddy current losses induced in them. Also called induction heating, dielectric heating or high-frequency heating.

electronics. A broad term used to cover a field which deals with the use, characteristics, and properties of electrons, especially in vacuum or gas filled tubes. For example, Radio, TV, Radar, control circuits, etc.

electronic scanning. Scanning with a cathode-ray tube, iconoscope or dissector tube as contrasted with mechanical scanning with a rotating disc or mirror drum.

electronic switch. A thyratron circuit designed to cause a start-and-stop action by DC control; also a "flip-flop" circuit triggered by horizontal sweep voltage (in CRO's, etc.).

electronic television. A television system employing cathode-ray tubes in an electrical process with no moving mechanical parts except accessories.

electronic voltmeter. See vacuum tube voltmeter.

electron image tube. A cathode-ray tube having a cathode of large area, coated with light-sensitive material upon which an optical image is projected. This causes corresponding emission of electrons from each point of the cathode. The resulting emission is focused by electron lenses upon a fluorescent screen, producing there a greatly enlarged visible image of whatever has been projected on the cathode. Used in earlier electron microscopes, in the electron telescope, and the infrared microscope.

electron lens. An arrangement of electrodes with or without magnetic deflecting and focusing coils, used to control the direction and size of a beam of electrons.

electron microscope. An instrument based on electron optics. Electron wavelengths are very small so they can serve as a basis for a high power microscope. Electrons from a source are focused by a condensing magnetic lens on the object which is placed on a transparent film. An objective magnetic lens produces an enlarged image which is further magnified by a projective magnetic lens which causes the final image to be projected on a screen or photographic plate. Magnifies to 20,000 diameters.

electron-multiplier phototube. A vacuum-type phototube that employs secondary emission to amplify the electron stream emitted from the illuminated photo-cathode. The electron stream impinges in turn on each of a series of reflecting electrodes called dynodes, at each of which secondary emission adds electrons to the stream. In one tube, an amplification of approximately 2,000,000 times is obtained with nine dynodes. Also called photoelectric electron-multiplier tube and multiplier-phototube.

electron-multiplier tube. A vacuum tube similar to an electron-multiplier phototube.

electron optics. Investigation of electrons from the standpoint that they behave like waves such as light. This viewpoint is useful when dealing with the properties of individual electrons. Electrons obey optical laws similar to those of light. A well-established theory is that, like light, electrons may be considered as particles and at the same time waves. However, electron waves are not, in this sense, electromagnetic. The wavelengths are very small and depend on velocity of the electron.

electron-ray tube. A cathode-ray tuning indicator tube.

electron tube. Any completely evacuated or gas-filled tube used to control the flow of electrons in a circuit. Vacuum tubes, phototubes, mercury vapor rectifier tubes and cathode ray tubes are all electron tubes.

electron volt. Unit of energy. The energy possessed by an electron which has fallen through a difference of potential of one volt.

electroplate. Coating of metal by means of electrolysis.

electroscope. A device for detecting small electrical charges and radioactive particles. Consists essentially of two gold-leaf plates suspended parallel to each other from the end of an electrode rod. When an electrical charge is applied to the electrode, the gold-leaf plates repel each other with a force directly proportional to the magnitude of the charge, thus serving as a detector of electrical charge. With the charged gold-leaf plates repelling each other, a radioactive particle passing nearby will ionize the air and cause the charge to leak away, the indication of radioactivity being the sudden partial or complete collapse of the gold-leaf plates to normal position.

electrostatic. Pertaining to electricity at rest.

electrostatic charge. An electric charge stored in a capacitor or on the surface of an insulated object.

electrostatic coupling. Capacitive coupling so that one circuit influences another through the capacitance.

electrostatic deflection. The result of an electric field produced between two parallel plates in a cathode ray tube. Application of a difference of potential to the plates causes a change in the path of the beam and a movement of the bright spot to a new location on the screen.

electrostatic field. The region near an electrically charged object. See electric field.

electrostatic focusing. Use of an electric field to focus an electron beam in a cathode-ray tube.

electrostatic induction. Accumulation of an induced charge on a conductor as a result of placing a charge in the vicinity. It is due to repulsion of like charges. If a negative charge (electrons) is brought near an uncharged conductor, electrons in the conductor will recede; leaving an induced positive charge. If, now, the conductor is grounded for a moment the electrons on it will escape; leaving the conductor with a stable positive charge.

electrostatic precipitation. An electronic apparatus for removing small particles (smoke, dust, oil mist, etc.) from the air by passing them through a screen and charging them, then attracting them to a properly polarized electrode.

electrostatic shield. A grounded metal screen, sheet, or object placed around or near a radio device to prevent the action of any electric field through the shield.

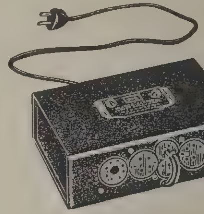
electrostatic speaker. A type of speaker employing a thin plastic membrane coated with a metallic film. This membrane, to which an electrical charge is applied, produces sound when it moves as a result of attraction or repulsion by unlike or like charges fed into the speaker. Electrostatic speakers are used as "tweeters" for the reproduction of treble frequencies.

electrostatic units. A system or units derived from the attraction or repulsion of unlike or like charges. Quantities in this system are related to the same quantities in the electromagnetic system by some power of 3x10^{10}. This is the speed of light in centimeters per second. This relationship is connected with the fact that light (and radio waves) are electromagnetic in nature.

element. 1. In chemistry, one of the 100 odd primary substances that cannot by chemical means be divided into simpler substances. 2. Any component part of a vacuum tube. 3. One of the conductors (other than the lead-in) of an antenna array.

eliminator. A device that supplies the current and voltages normally obtained from batteries which the device replaces. Eliminators are rectifiers operating from AC power lines.

elliptical path. Closed curve on the plate characteristic which shows corresponding current and voltage values during operation with a load containing reactance. The curve is an ellipse with center at the operating point. A line connecting the points of maximum and minimum current passes through the operating point and represents the AC load line.



Battery Eliminator

emanation. The gaseous radioactive products formed by the expulsion of an alpha particle from radium, thorium X, or actinium X. Now known as radon, thoron, and actinon, respectively.

embossed recording. A method of sound recording on discs or film by mechanical pressure. Modulation grooves are formed by pressure displacement of the recording base material, instead of by the conventional method of cutting out the material completely.

emf. Abbreviation for electromotive force or voltage.

emission. 1. The process of radiating radio waves into space by a transmitter. 2. The process of ejecting electrons from the surface of a material under the influence of heat, radiation, or other causes.

emission efficiency. Hot cathode rating in milliamperes per watt. For a given material, efficiency increases with temperature. This fact is utilized in many power tubes. With more efficient emitters temperature of operation may be lowered. This is utilized in most small receiving tubes. Tungsten filaments are least efficient (2 to 10 ma/watt) Thoriated tungsten is better. Oxide coated filaments are still more efficient (600 ma/w) although indirectly heated cathodes are of lower efficiency. Thorium oxide cathodes of high efficiency are used for some purposes.

emission types. The classification of modes of radio transmission, as adopted by international agreement. **Type A 0.** Unmodulated, un-keyed, continuous wave transmission. **Type A 1.** Telegraphy on pure continuous waves. **Type A 2.** Modulated telegraphy. **Type A 3.** Telephony. **Type A 4.** Facsimile. **Type A 5.** Television.

emission velocity. The initial velocity with which electrons emerge from a cathode surface. This ranges from zero up to a few volts (attained by very few electrons). Electron velocity in *volts* is a convenient way of expressing the speed an electron would have after moving through a potential difference of that number of volts. This effect accounts for the existence of virtual cathodes; also for the shape of the cut-off region of plate current.

emitron camera. A British television camera employing a cathode-ray tube.

emphasizer. A series of components connected in a circuit to increase signal amplitude at certain audio frequencies. Term usually connected with FM transmission.

enameled wire. Wire coated with an insulating layer of baked enamel.

end effect. 1. The effect of capacitance at the ends of an antenna. 2. The effect of inductance at the end of a coil.

end-fire antenna array. An array in which the elements are side by side, parallel, all lying in the same plane and the currents are out of phase. Radiation is maximum along the plane of the antenna.

energy. Capacity for performing work. Motional energy is called kinetic energy. Positional energy is called potential energy.

energy levels. Energy states in an atom in which electrons can exist within the atom. Only a certain number of electrons can be in each energy level. Electrons can be raised to higher levels by receiving precisely the necessary energy. These same precise amounts of energy appear as radiation when an electron falls to a lower energy state. Such energy transfers are the basis of gaseous discharges. The ionizing potential is a measure of the energy necessary to remove an electron entirely from the atom.

energy storage in tuned circuits. The alternate transfer of energy between the inductor and capacitor of a tuned circuit under oscillating conditions. The rate of decay or need for resonant impulses from the line is dependent on the resistance of the circuit. Thus $\omega L/R$ is a measure of the Q.

envelope. The glass or metal housing of a vacuum tube.

envelope of wave. A smooth curve drawn so as to touch the positive and negative peaks of an amplitude modulated wave outlining the modulating wave.

equalizer. Any combination of components inserted in an audio- or video-frequency amplifier circuit to change its frequency response in a desired manner.

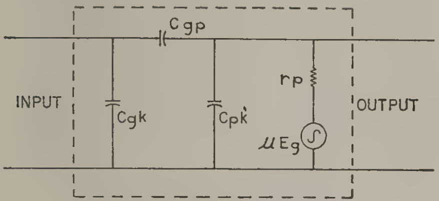
equalizing pulses. A series of 6 pulses occurring at twice the horizontal frequency and used to maintain proper scanning line interlace in a television system.

equipotential. Having the same voltage at all points.

equipotential cathode. A cathode to which heat is supplied by an independent heater element in a thermionic tube. Also called indirectly heated or unipotential cathode.

equipotential lines. In a static or magnetic field, a system of lines drawn so as to be at every point perpendicular to the lines of force. If, as with an electrolytic tank, the system of equipotentials can be established, the lines of force can then be determined.

equivalent circuit. An electrical circuit used in analyzing the function of electronic devices such as vacuum tubes, crystal cartridges, etc. The circuit is made up of series and parallel capacitors, inductors and resistors that are equivalent to the internal capacitance, inductance and resistance of the device under study.



Equivalent Circuit of a Triode Tube

equivalent grid voltage. The grid voltage plus the plate voltage divided by mu ($E_g + E_b/\mu$).

equivalent height. The virtual height of an ionized layer of the ionosphere.

equivalent plate voltage. The plate voltage plus mu times grid voltage. ($E_b + \mu E_g$).

E region. A region in the ionosphere, between about 55 and 85 miles above the surface of the earth, which contains ionized layers capable of bending or reflecting radio waves.

E_r-E_y. A color television signal which is the result of subtracting E_y from the original full red signal.

erg. The absolute cgs unit of energy and work. It is the work done when a force of one dyne is applied through a distance of one centimeter.

escutcheon. Ornamental metal, wood, plastic, or other plate used around a radio tuning dial, control knob, or other panel-mounted part in a radio receiver, etc.

ether. A hypothetical medium that has been supposed to fill all space and serve as a medium of propagation for light, radio waves, and other forms of radiation. Its existence is at present denied by scientists.

evaporation of electrons. That cooling process which occurs at the surface of a cathode during emission. It is analogous to the cooling effect resulting from the evaporation of a liquid or solid.

excitation. 1. Application of a signal to the input of a vacuum-tube in an rf or af amplifier stage. 2. Application of voltage to the field coils of a motor, generator, electrodynamic loudspeaker, or other device that produces a magnetic field. 3. Acquisition of energy by an atom insufficient to produce ionization, but which puts the atom in an excited state.

excitation anode. Starting anode of a mercury arc rectifier.

exciter. 1. That part of a directional antenna system which is directly connected to the transmitter or receiver. 2. The crystal oscillator or self-excited oscillator that generates the carrier frequency of a transmitter.

exciter lamp. An intensely bright incandescent lamp having a concentrated filament, used in recording and reproducing all types of sound tracks on film.

exciting current. Current which flows in the primary of a transformer when the secondary is open-circuited. This current produces flux to generate a back EMF equal to the applied voltage.

expansion. Widening the volume range of an audio-frequency signal so that weak passages become weaker and loud passages become louder. Volume expansion.

exploring coil. A small coil used to measure a magnetic field. Also called flip coil.

exponential horn. A horn whose cross-sectional area varies exponentially with its length. It is an impedance matching device between the diaphragm and free space. Has a low frequency cut-off value dependent on the taper.

extended cutoff. See remote cutoff tube.

extended play record. A 7-inch, 45-rpm record, with microgrooves spaced closer together, to provide up to 8 minutes of playing time per side, compared to 3 minutes per side with conventional 45-rpm microgroove records. Abbreviated EP.

external resistance. The resistance that is connected externally between the terminals of a battery, generator, or meter compared to the internal resistance of the device.

extinction potential. The lowest plate voltage at which plate current will continue to flow in a gas-filled tube.

Extra Class License. The highest classification of United States Amateur license. The examination for this license includes a code sending and receiving test at 20 words per minute, as well as a test covering advanced theory, regulations, and operating techniques. To be eligible for the Extra Class license the applicant must have held for at least two years an Amateur license (other than Novice or Technician Class) issued by the Federal Communications Commission. If an applicant holds or can qualify for a General Class license and if he held an Amateur license prior to May, 1917 he can then obtain the Extra Class license without taking the Extra Class examination. At present, no extra privileges are granted to holders of this license and privileges are the same as that for the General Class and Conditional Class licenses.

F

f. Symbol for frequency.

F. Symbol for filaments of a tube.

facsimile. A system of communication in which previously reproduced images such as photographs, drawings, handwriting or printed matter are transmitted for graphically recorded reception.

facsimile broadcast station. A station duly licensed to transmit facsimile for reception by the general public.

facsimile receiver. The apparatus employed to translate the facsimile signal into a graphic record.

facsimile recorder. An instrument which reproduces on paper the illustration, writing or printed matter being transmitted by a facsimile system.

facsimile transmission. The electric transmission, either over wires or by radio of a still image of a previously reproduced graphic record.

facsimile transmitter. The apparatus employed to convert the subject copy into suitable facsimile signals.

fade. To change gradually in signal amplitude.

fade in. To increase strength gradually of a previously weak or inaudible signal. It is the opposite of fade out.

fade out. To reduce strength gradually of a previously strong or loud signal.

fadeout. 1. Failure of radio waves to arrive at a location either because of magnetic storms, atmospheric disturbances or other conditions along the transmission path. 2. Intentional and gradual disappearance of a television scene, produced at one television camera or its control circuit during changeover to another television camera.

fader. A multiple-unit volume control used in radio for gradual changeover from one microphone or audio channel to another, and in television for changeover from one camera to another. In each instance the impedance is held constant by the construction of the volume control.

fading. A variation in the signal intensity at a given location, at a given dial setting of a receiver, or at a given volume setting of an amplifier.

Fahnestock clip. A spring-type terminal to which a temporary wire connection can readily be made.

Fahrenheit. The temperature-measuring system generally used in the United States, in which 32 degrees is the temperature of melting ice and 212 degrees is the temperature of boiling water at sea level.

fan antenna. An antenna in which the various elements are in a vertical plane and spread out fanwise from a common lower junction.

farad. Unit of capacitance. In the practical system of units the farad is too large for ordinary use, and capacity measurements are made in terms of microfarads and micro-microfarads. The microfarad is one millionth of a farad, the micro-microfarad one millionth of a microfarad. Both are commonly used in radio.

faraday. A unit of electricity equal to 96,500 coulombs. This is the quantity of electricity which will alter one gram equivalent weight of matter at each electrode during electrolysis.

Faraday shield. A network of parallel insulated or separated wires in a single plane connected to a common conductor at one end of the wires (like a comb). The common conductor is usually grounded. Called Faraday screen.

FCC. Federal Communications Commission.

Federal Communications Commission. A board of commissioners appointed by the President, having the power to regulate all electrical communications systems originating in the United States, including radio, television, wire, and cable systems.

feedback. Transfer of a portion of energy from one point in an electrical system to a preceding point, such as from the output back to the input. The transfer may be either electrical or acoustical; and it may increase stability or fidelity or cause howling and squealing depending on the type, amount and phase of feedback.

feedback oscillator. A vacuum-tube oscillator employing feedback to maintain oscillation.

feedthrough capacitor. A very efficient type of bypass capacitor which is so designed that the inner foil is in series with the wire to be bypassed and the outer shell is coaxial to the wire.

Feedthrough Capacitor

feedthrough insulator. A type of insulator which permits feeding of wire or cable through walls, chassis, etc. with minimum leakage of current.

female connector. See connector.

fernichrome. An alloy of 30% iron, 25% nickel, 8% cobalt and 37% chromium used to make seals to soft glass for vacuum tubes.

ferrite. An iron compound in which the iron is bivalent, and which contains a small percentage of carbon. Used in transformers, computer memories, etc.

ferrospinel. A combined form of material, ceramic-like in quality, which contains iron and other elements, together with oxygen. Not an efficient conductor of electricity, it is used in transformers, antenna loops, etc.

field emission. Auto-electric emission. The extraction of electrons from a metallic surface, hot or cold, by the application of a powerful electric field.

fiber. A hard, tough insulating material.

fiber needle. A playback phonograph needle made of fiber.

fidelity. The degree of exactness with which a system or portion of a system reproduces an input signal.

field. (1) The effect produced in surrounding space by an electrically charged object, by electrons in motion, or by a magnet. (2) In television, the area picked up by the television camera. (3) In television, the area covered during one vertical sweep of the scene by the scanning element.

field coil. An insulated winding energized by dc voltage, and mounted on a field pole so as to magnetize it.

field distribution of antennas. The field strength in angular directions from the antenna. Shown graphically as loops or circles with the antenna at the axis. Field strength in any direction is shown by the straight-line distance from the antenna to the figure in that direction. The number and position of the loops for a single wire depend upon the relation of antenna length to wavelength. A study of single wire patterns makes possible the design of directional antennas.

field frequency. In television, the number of complete downward sweeps of the scanning element per second. Also the number of times per second that the frame area is fractionally scanned. In the U. S., the standard is 60 fields per second.

field intensity. In radio, it is the effective value in microvolts or millivolts per meter, produced by radio waves from a particular station. *Syn.:* field strength.

field-neutralizing coil. A coil placed around the faceplate of a color picture tube. DC passing through this coil produces a magnetic field which protects the electron beam from stray external fields.

field of view (*field*). In television, the area or angle picked up by the lens of the television camera. Also, the area covered by one vertical sweep of the scene by the scanning element.

field pattern. Usually expressed as a polar diagram, to indicate the horizontal field strength characteristics of an antenna. Sometimes referred to as a polar plot.

field period. In television, the length of time it takes to scan one field. Equal to 1 divided by the field frequency.

field repetition rate. See field frequency.

field pole. A structure of magnetic material on which a field coil may be mounted or wound.

field strength. Field intensity.

field strength meter. A measuring instrument used to determine the strength of radiated energy (field strength) from a radio transmitter. Field strength meters are usually portable to permit making measurements at any desired location. Widely used to determine the directional characteristics of broadcast transmitting antennas and to determine the possibility of television reception at various distances from the transmitter.

figure of merit. A property or characteristic of a tube, coil or other electronic device which makes it suitable for a particular application. A quality to be looked for in choosing a piece of equipment. Thus amplification factor is a figure of merit of a triode for use as an audio frequency amplifier tube. For maximum AC power in a triode a figure of merit is the product of amplification factor and transconductance. Both of these depend solely on tube design. Often figures of merit involve circuits, such as that for broad-banding of amplifiers. This is the transconductance of the tube divided by the sum of the input and output capacitances.

filament. The wire through which current is sent in a vacuum tube to produce the heat required for electron emission.

filament circuit. The complete circuit over which filament current flows from the A battery, filament transformer winding or other filament voltage source to the filament of radio tubes and pilot lamps.

filament current. The current supplied to the filament of a vacuum tube for heating purposes.

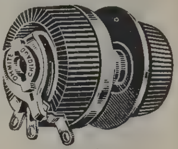
filament emission. Evolution of electrons from a heated filament in a vacuum tube.

filament power supply. A source of power with proper voltage and regulation for the filament or heater of a vacuum tube.

filament resistance. The resistance in ohms of the filament of a vacuum tube or incandescent lamp.

filament rheostat. A variable resistance connected in series with the filament of a vacuum tube to regulate the current.

filaments in gas tubes. In high-pressure discharge tubes the gas serves as a protecting sheath for the cathode. Thus, oxide-coated ribbons or tungsten coils may be used. In low pressure arcs containing filament or heater cathodes, temperatures are low and area is large. The metal is crinkled or spiraled so as to cut down heat losses. In such an arc the emitted electrons need not be directly in the field. Such cathodes are slow to heat and the tubes should not be operated before coming to temperature.



Filament Rheostat

filament transformer. A transformer used exclusively to supply filament voltage and current for vacuum tubes.

filament voltage. The voltage value which must be applied to the filament terminals of a vacuum tube in order to provide the rated value of filament current.

filament winding. A separate secondary winding provided on the power transformer of a radio receiver or other a.c.-operated apparatus for use as a filament voltage source.

film scanning. Converting film images into electrical signals that can be transmitted by a television system and reproduced as images by television receivers.

filter. A resistor, coil, capacitor or any combination of these parts which is used to block or attenuate alternating currents at certain frequencies while allowing essentially unimpeded flow of currents at other frequencies or of direct current. Thus, the filter in a radio power pack is a ocil, capacitor and resistor combination which receives a pulsating direct current having many AC components but delivers an essentially pure and constant direct current. In color TV bandpass filters are used to separate the luminance and chrominance video signals.

filter capacitor. A capacitor used in a power-pack filter system to provide a low-reactance path for alternating currents.

filter choke. An iron-core coil used in a power-pack filter system to pass direct current while offering high impedance to pulsating or alternating currents.

fine chrominance primary. In color TV the transmission primary which is sent with a greater bandwidth in order to produce fine chrominance detail in the picture. Referred to as the I signal and has frequency components up to 1.5 mc as compared to only .5 mc for the Q chrominance signal.

Filter Capacitor

fins. Radial sheets or discs of metal attached to metal parts of a power tube or other component for dissipating heat.

firing. In any gas- or vapor-filled tube, it is the process of gas ionization and the start of current flow.

firing point. The point at which the gas or vapor in a tube ionizes and current begins to flow. See firing.

firing potential. The critical plate-cathode voltage in a gas- or vapor-filled tube required for tube to become conductive. This voltage depends on the voltage on the grid.

first audio stage. The first stage in the audio amplifier of a radio receiver. Audio signals are fed into this stage by the detector of a t.r.f. receiver, and by the second detector of a superheterodyne receiver.

Filter Choke

first detector. The stage in a super-heterodyne receiver where the radio-frequency signal from the local oscillator is combined with the incoming modulated radio-frequency signal to produce the modulated intermediate-frequency signal. Also called mixer or the mixer-first detector.

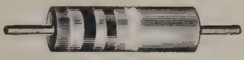
fishpaper. A type of fiber paper for insulating purposes where high mechanical strength is required.

fishpole antenna. A whip antenna, commonly used for automobile radios. Utilizes telescoping rods.

fix. A determination of position by means of radio direction finders or other navigational equipment.

fixed bias. A constant value of bias voltage.

fixed capacitor. A capacitor having a definite value that cannot be changed.



Fixed Resistor

fixed resistor. A resistor having a definite value that cannot be changed.

flag. 1. A small bracket in a cathode-ray tube on which "getter" material is deposited prior to exhaustion of the tube. After exhaustion, the getter material is fired electronically to further increase the vacuum. 2. A sheet of metal or other material which serves to shield a television camera from extraneous light.

flashover. A disruptive discharge around or over the surface of an insulator, or between two charged surfaces not in contact with each other.

flat-top response. A response characteristic in which a definite band of frequencies is transmitted or received uniformly. In intermediate-frequency transformers, it is obtained by tuning the primary and secondary resonant circuits to slightly different frequencies. *Syn:* band-pass response.

F layer. An ionized layer in the F region of the ionosphere.

F_1 layer. The lower of the two ionized layers normally existing in the F region in the day hemisphere.

F_2 layer. The higher of the two ionized layers normally existing in the F region in the day hemisphere.

Fleming's rule. See right-hand rule.

Fleming valve. Early name for a two-electrode vacuum tube.

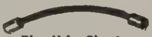
Fletcher-Munson curves. A set of curves showing the amount of acoustic power required at different frequencies to make these different frequencies sound equally loud to a listener. See loudness control.

flexible coupling. A connector for joining two shafts end to end and permitting rotation even though the two shafts are not aligned.

Flexible Couplings

flexible resistor. A wire-wound resistor having the appearance of a flexible lead. It is made by winding Nichrome resistance wire around a length of asbestos or other heat-resistant cord, then covering the winding with a braided insulating covering. This covering is generally RETMA color coded to indicate the resistor value.

flexible shaft. A shaft that transmits rotary motion at any angle up to about 90 degrees. Used in electronic equipment to permit mounting adjustable controls at optimum positions with respect to other parts while still securing desirable groupings of controls on the panel. Used in automobile radios.



Flexible Shaft

flicker. Rapid, erratic movements on the screen of a TV receiver with multiple frames briefly visible.

flip coil. A small coil used to measure a magnetic field. Also called exploring coil.

flip-flop. (1). A color television term which indicates changes in color phase. (2). An Eccles-Jordan trigger circuit, in which an applied pulse causes conduction to transfer from one tube or transistor to another one.

floating battery. A storage battery connected permanently in parallel with another power source. The battery normally handles only small charging or discharging currents, but takes over the entire load upon failure of the main supply. Usually used as a voltage stabilizing device.

floating grid. A free grid. A vacuum-tube grid that is not connected to any circuit. It assumes a negative potential with respect to the cathode, due to electrons hitting the grid wires. Used in some high sensitivity VTVM and photo-cell circuits.

flock. Finely divided felt used on phonograph turntable surfaces, underneath microphone stands, and in similar locations where a nonscratching surface is desired.

fluctuation voltage. Small voltage variations occurring in a tube due to thermal agitation, or shot effect.

fluorescent. Having the property of emitting light during electronic bombardment. If emission of light persists after termination of bombardment, the effect is phosphorescence.

fluorescent lamp. An artificial source of light, basically an electric discharge lamp, in which ionization of the gas produces radiation that activates the fluorescent material on the inside of the glass tubing, creating visible light.

fluorescent screen. A sheet of suitable material coated with a phosphor that fluoresces visibly when hit by an electron beam, X rays, or radium rays. Used in electron beam tubes.

flush-type instrument. A meter, panel-mounted so that its face projects only slightly beyond the front of the panel.

flutter. 1. Distortion in sound reproducing systems caused by the uneven motion of a film or tape feeding mechanism. Occurs in record players whenever the speed of the turntable is not uniform. 2. Low frequency noises in a speaker due to a defective amplifier. 3. Rapid flicker of TV picture due to passing aircraft.

flux. 1. A material used to promote fusion or joining of metals in soldering, welding, or smelting. Rosin is widely used as a flux in electronic soldering. 2. A general term used to designate collectively all the electric or magnetic lines of force in a region.

flux density. The number of electric or magnetic lines of force cutting the unit area at right angles.

flux linkage. Magnetic lines of force which link a coil of wire. If the number of flux linkages changes in a coil, an EMF is generated proportional to the rate of change.

fluxmeter. Also fluxometer. An instrument for measuring magnetic flux density, usually by means of a test coil.

fly-back. The portion of the time base in the operation of a cathode-ray tube in which the spot is returning to the starting point. Also called retrace.

flyback checker. An instrument which tests flyback transformers, as well as other transformers and inductances for the presence of shorted turns and open windings.

Flyback Checker

flyback transformer. A transformer used in the horizontal deflection circuit of a television receiver. It provides horizontal scanning voltage and beam accelerating anode voltage for the cathode-ray tube, as well as filament voltage for the high-voltage rectifier. Also called horizontal output transformer.

fly cutter. A circle cutter. Used to cut holes in metal or wood.

flywheel effect. The effect of the resonant circuit in a class C oscillator or feedback amplifier. Although the grid controls the input energy in pulses as in the cylinder explosions of a gasoline engine or the escapement mechanism of a clock, the resonant circuit maintains continuous operation as does the flywheel of the engine or the pendulum of the clock.

flywheel synchronization. Automatic frequency control of the scanning circuit, wherein the sweep oscillator responds to the average timing of the sync pulse.

flywheel tuning. A receiver tuning dial mechanism which makes use of a heavy flywheel on the control shaft. The flywheel adds momentum for smoother tuning.

f.m., FM. Abbreviations for frequency modulation.

focal time. In an aperture electron lens, focal time corresponds to focal length in an optical lens. Light rays going through an optical lens are plotted as straight lines when the coordinate along the axis is a space coordinate. A similar treatment in the case of an aperture electron lens shows the electron paths as parabolas. If the axial coordinate is chosen as time, the electron paths are straight.

focusing. The adjustment of the electron beam in a cathode-ray tube to secure a sharp image on the luminescent screen. The beam is caused to converge to as small a diameter as possible.

focusing coil. A coil or PM magnet surrounding the neck of a cathode-ray tube or television camera tube, used to sharpen the beam at the fluorescent screen.

focusing control. In a cathode ray oscilloscope or television system, the control which adjusts the size of the visible spot produced at the screen by the electron gun in a cathode ray tube.

focusing electrode. An electrode to which a potential is applied to control the cross-sectional area of the electron beam in a cathode-ray tube.

folded dipole. A receiving or transmitting antenna composed of two parallel dipoles, connected together at the ends and with connections to the receiver or transmitter made at the center of one of the dipoles.

foldover. In television, white lines visible on either side, top or bottom of the picture. Result of non-linear operation in either the horizontal or vertical deflection circuits.

foot-candle. The illumination produced at a distance of one foot by a one candle power source.

forced vibrations. Mechanical oscillations set up in an object at a frequency sufficiently remote from its natural or free frequency so that no resonance response occurs.

force pump. An auxiliary vacuum pump used as the first stage in evacuating vacuum tubes.

Formex. A thin, enamel-like insulation of high tenacity.

form factor. Term used in describing the quality of rectified current. It is the ratio of the effective to the average current. Related to the ripple factor such that the ripple factor is the square root of the quantity: form factor squared minus one. Also used to describe the shape (diameter/length) of a coil.

Formica. A phenolic compound. An excellent insulator.

Fourier series. A series of sine and cosine terms of integral-multiples of frequency. Used in evaluating the coefficients of harmonics of complex waves.

four-track tape recorder. A tape recorder with which two stereo channels are recorded on one-half of the available tape width and another two channels are recorded on the other half of the tape width. To play all the material on the tape, it is first played in one direction, and then, in the other. Four-track recording permits twice as much material on a given length of tape.

Frahm frequency meter. A frequency meter consisting of a row of steel reeds, each having a different natural frequency. All are excited by an electro-magnet that is fed with the alternating current whose frequency is to be measured. That reed vibrates whose frequency corresponds most nearly with that of the current.

frame. 1. In TV, a single complete picture. 2. In facsimile, a rectangular area whose width is that of the available line and whose length is determined by the service.

frame frequency. In television, the number of times per second that the picture area is completely scanned. In color or black-white, the frequency is 30 cps.

framing. In a television or facsimile system, adjustment of the picture to a desired position with respect to the field of view, generally a central position.

framing control. 1. In TV, any of the controls that adjust the centering, width, or height of the image. 2. In facsimile, the control that shifts the picture horizontally.

Franklin antenna. A type of short-wave antenna in which several half-wave sections are used one above the other, with coils between the sections.

free electron. An electron which is not attached to any one atom, but free to move among them.

free grid. See floating grid.

free oscillation. Oscillation that continues in a circuit after the impressed voltage has been removed.

free-point tester. An instrument that permits transferring a tube from a radio receiver to a test panel at which either voltage or current measurements for any electrode of the tube are readily made by plugging a meter into appropriate jacks. Connections to the receiver are made by means of cord and plug inserted in the socket from which the tube was removed.

F region. That region of the ionosphere extending from about 90 to 250 miles above the earth's surface.

frequency. The number of complete cycles or vibrations per unit of time, usually per second. Frequency of a wave is equal to the velocity divided by the wavelength.

frequency band. A continuous range of frequencies extending between two limiting frequencies.

frequency changer. A rotating machine for changing the frequency of an alternating-current system, with or without a change in voltage or in the number of phases.

frequency conversion. The process of converting the original frequency of a signal to some other frequency by combining it with a second frequency.

frequency converter. Any circuit or device that accomplishes a frequency conversion, as for example the mixer-detector of a superheterodyne. Also an arc tube. Also a motor-generator.

frequency demodulation. The conversion of a frequency-modulated signal into an audio-frequency signal.

frequency deviation. In frequency modulation, the number of cycles by which the modulated carrier frequency differs from the resting frequency.

frequency-deviation meter. A frequency monitor. An instrument that indicates the number of cycles a transmitter has changed by drifting or otherwise, from its assigned or resting carrier frequency.

frequency discrimination. Distortion occurring when different frequency components in a signal are given unequal amplification.

frequency discriminator. A circuit that converts a frequency-modulated signal into an amplitude-modulated signal or a varying direct current.

frequency distortion. A type of distortion occurring when a circuit or device amplifies or transmits unequally the different frequencies it is handling.

frequency divider. A frequency-changing circuit which produces an output frequency equal to a submultiple of the input frequency.

frequency doubler. A vacuum-tube stage having a resonant plate circuit that is tuned to twice input frequency.

frequency drift. A slow undesired change in the frequency of an oscillator, transmitter or receiver.

frequency meter. An instrument for measuring the frequency of a radio or audio signal.

frequency-modulated transmitter. A radio transmitter that emits or radiates a frequency-modulated wave.

frequency-modulated radar. A radar system that utilizes a sawtooth-voltage, frequency-modulated carrier. Thus, the wave reflected from the target beats with the changed transmitter frequency. As a result, the beat frequency becomes a function of the distance between the transmitter and the target.

frequency-modulated wave. A radio frequency wave of constant amplitude, but of varying frequency. The frequency varies about the normal or rest frequency, at an audio frequency rate determined by the signal frequency with which it is being modulated.

Frequency Meter

frequency modulation. A method of modulating a carrier-frequency by causing the frequency to vary above and below the monomodulation value in accordance with the sound to be transmitted. The amount of deviation in frequency above and below the resting frequency is at each instant proportional to the amplitude of the sound being transmitted. The number of complete deviations per second above and below the resting frequency corresponds at each instant to the frequency of the sound being transmitted. Advantages of this system include almost complete freedom from atmospheric and man-made interference, as well as little or no interference between stations, thereby permitting the transmission of a much greater volume range and a wider audio frequency range than is possible with amplitude modulation.

frequency monitor. An instrument that indicates the amount of frequency deviation.

frequency multiplier. A frequency changer used to multiply an original frequency by an integral value. See frequency doubler.

frequency range. A frequency band including the frequencies at which a system is able to transmit, receive, attenuate or amplify power.

frequency record. A phonograph record on which various frequencies throughout a desired audio-frequency range have been recorded for test purposes.

frequency regulator. A device that functions to maintain the frequency of a generator at a predetermined value.

frequency relay. A relay that is actuated by a change in frequency.

frequency response. A rating or graph which expresses the manner in which a circuit or device handles the different frequencies falling within its operating range. Thus, the frequency response of the Knight high-fidelity amplifier may be specified as being essentially flat or uniform between 20 and 20,000 cycles per second.

frequency-response curve. A graph showing the frequency response of a radio or audio part, circuit, or system.

frequency separator. In a television receiver, the stage or circuit that separates the horizontal synchronizing impulses from the vertical synchronizing impulses.

frequency shift. A change in the frequency of a radio transmitter, oscillator, or receiver.

frequency-shift transmission. A system of automatic code transmission and reception that shifts the carrier frequency back and forth between two distinct frequencies to designate mark and space, instead of keying the carrier on and off.

frequency stability. 1. The ability of a radio transmitter to maintain any predetermined frequency. 2. The ability of an oscillator to maintain the frequency to which it is initially adjusted.

frequency standard. A stable oscillator used for frequency calibration.

frequency swing. In frequency modulation, the instantaneous departure of the carrier frequency from the resting frequency, resulting in modulation.

frequency tolerance. The extent to which frequency may be permitted to vary above or below a predetermined value.

frequency tripler. A stage having a resonant plate circuit that is tuned to three times the frequency of the input signal. See frequency multiplier.

friction tape. Cotton tape impregnated with a sticky moisture-repellent compound used chiefly over a joint or splice. Friction tape has relatively poor insulating qualities.

fringe area. An area or locality at such a distance from the transmitting station that the signals received are weak.

fringe howl. A squeal or howl heard when some circuit in a receiver or amplifier is on the verge of oscillation.

front porch. The blanking level part of the TV sync pedestal which precedes the sync pulse.

front-to-back ratio. The ratio of the effectiveness of a directional antenna, microphone or loudspeaker toward the front and toward the rear.

full-wave rectifier. A radio tube, selenium rectifier, or other device which rectifies an alternating current in such a way that both halves of each input AC cycle appear in the pulsating rectified output. A full-wave rectifier tube contains two separate diode sections, one passing current during one alternation, and the other passing current during the opposite half cycle. Bridge rectifier circuits are often used for full-wave rectification. See selenium rectifier.

full-wave vibrator. Used in a battery-operated power supply for automobile or marine use. Has two contacts arranged so that the battery discharges an alternating intermittent current through a transformer, usually to a full-wave rectifier.

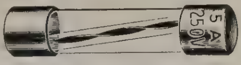
function. Any quantity, the value of which depends upon the value of another quantity, is said to be a function of the latter quantity. For example: the resistance of a wire depends upon or is a function of its temperature. Curves are representations of functional relationships.

fundamental. The lowest frequency component of a complex vibration, sound, tone, or electrical signal.

fundamental frequency. See fundamental.

fundamental harmonic. Same as fundamental. First harmonic.

fundamental wavelength. The wavelength of the fundamental frequency.



Fuse

fuse. A protective device consisting of a short piece of wire which melts and breaks when the current through it exceeds the rated value of the fuse. Fuses are inserted in radio circuits to open the circuits automatically in case of serious overload, thereby preventing damage to parts in the circuit.

Fuse Block

fuse block. An insulating base on which are mounted fuse clips or other contacts for holding fuses.

fuse clip. A spring contact for holding a cartridge fuse in position and providing a connection.

fuse wire. Wire made from an alloy that melts at a relatively low temperature.

G

G. Symbol for control grid of a tube.

g_m. Designation for the mutual conductance of a vacuum tube.

gain. The ratio of output voltage, current, or power to the input voltage, current or power respectively in an amplifier stage, receiver or system. Usually expressed in db.

gain control. 1. A control connected so that it can change the over-all gain of an amplifier. 2. Any volume control.

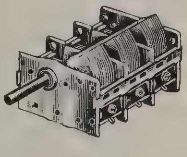
gain of an antenna. A rating used in comparing a complex antenna array usually with a simple doublet antenna.

galena. Lead sulphide, a shiny bluish gray mineral, used as the crystal in crystal detectors.

galvanometer. A D'Arsonval laboratory instrument usually of suspension type for measuring or indicating extremely small electric currents. Its scale usually indicates relative deflection, and the actual current, voltage, or charge value must be calculated.

gamma. In TV, a definite numerical indication of the degree of contrast. In color TV, a coefficient defining the relation between the luminance of a picture and video grid voltage. Light input or output vs. video voltage is not a linear relation and gamma must be taken into account so that corrections can be made.

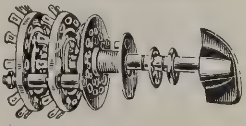
gamma rays. Electromagnetic radiation emitted by certain radioactive substances. Have a shorter wavelength and are more penetrating than X-rays but are similarly used.



Gang Capacitor

gang capacitor. Two or more variable capacitors mounted mechanically so they can be simultaneously turned by a single shaft.

gang control. A number of similar pieces of apparatus so mounted that they can be simultaneously adjusted or tuned by a single control or shaft.



Gang Switch

gang switch. A number of switches so mounted as to provide one gang control of all. Deck switches.

gap. 1. That portion of a magnetic circuit in which there is no ferromagnetic material, *i.e.*, the tiny distance between the poles of a recording head. 2. The space between the surfaces of two electrodes as in a spark gap.

gap arrester. A type of antenna lightning arrester in which there are one or more air gaps in series between rods of metal, such as zinc and connected to ground. The antenna is insulated from ground by the air in the gaps.

gas (*as compared with a vapor*). Substance having a boiling point below normal ambient temperatures and pressures. It is a fixed or permanent gas; whereas, a vapor is a gaseous material evaporated from a substance which is liquid or solid under normal ambient conditions. Neon is a true gas, having a boiling point at −246° C, Mercury is a liquid having a boiling point of 357° C. Mercury vapor pressure at room temperature is about one micron. In gas or vapor tubes the distinction is significant in that the pressure of a gas is altered only slightly by temperature changes, whereas the pressure of a vapor may be adjusted by changing temperature, provided a reservoir of liquid is present. Thus pressure of a vapor is not affected by cleanup; but excess gas is sealed in tubes in anticipation of this effect.

gas amplification factor. Ratio of the sensitivity of a gas photocell to that of a vacuum cell under identical conditions of voltage and light flux.

gaseous rectifier. A gas-filled rectifier which may have a hot cathode, a mercury pool or a cold cathode.

gaseous tube. An electronic tube into which a small amount of gas or vapor is admitted after the tube has been evacuated. Ionization of the gas molecules during operation of the tube gives greatly increased current flow.

gas-filled lamp. A tungsten-filament lamp containing nitrogen or argon, and a tightly coiled filament. Purpose is to minimize evaporation of the filament; permits operation at higher temperature with increased efficiency.

gas-filled thyratron. A thyratron tube with argon or xenon (as the type 2D21) or some other gas.

gas-filled tube rectifier. Same as gaseous rectifier.

gassing. 1. The production of gases from one or more of the electrodes during electrolysis. 2. Liberal production of gas in a storage battery when charging is continued after the battery is completely charged.

gassy tube. High-vacuum or other tube in which a leak has developed, admitting air. A "soft" tube.

gate. A square-wave voltage applied to the cathode or grid of a cathode-ray tube to energize it only during the sweep time. Also, a tube or circuit that passes signals only when certain control voltages are present. Used in electronic counters and computers, as "triggers."

gating. In television, the blanking pulse which applies voltage to the cathode or grid of a cathode-ray tube to sensitize it only during the sweep time.

gauge. A device for determining whether a specified dimension is within specified limits. The designation of a wire size, for example No. 18 gauge.

gauss. Electromagnetic unit of magnetic flux density. It is one maxwell per square centimeter.

Geiger-Muller counter. A gas-filled tube consisting of a metallic cylindrical sheath having a slender wire running axially through its center, used for detecting X-rays, gamma rays, beta rays, alpha rays, etc. The tube is operated just below discharge voltage. Radiation traversing the gas causes a transient burst of discharge which actuates an amplifying or counting circuit.

genemotor. Same as dynamotor.

General Class license. A class of United States Amateur license. Holders of this license have full Amateur privileges. The examination for the General Class license consists of a code sending and receiving test at thirteen words per minute, a test on radiotelephone and radiotelegraph equipment, as well as a test covering treaties, rules and regulations affecting Amateur communications.

generator. A rotating machine which converts mechanical energy into electrical energy. Also, a radio device or circuit which develops an a.c. voltage at a desired frequency when energized with d.c. or low-frequency a.c. power. *See* oscillator.

germanium. A grayish-white, brittle metallic element widely used in electronic applications. When a small "whisker" is placed in contact with germanium, the combination will pass current in essentially one direction; this phenomenon is utilized in the germanium diode. It has been more recently found that the addition of certain impurities to germanium creates either a deficiency of electrons ("holes") or surplus of electrons in the germanium. These surplus electrons as well as the "holes" are free to move about, and are the basis of transistor design.

germanium diode. A very small type of diode employing the element germanium.

getter. An alkali or alkaline earth metal introduced into a vacuum tube during manufacture and vaporized after the tube has been evacuated. When vaporized it absorbs any gases which may have been left by the vacuum pump. The silvery deposit in the glass envelope, usually near the tube base, is the result of getter action.

ghost image. In television, an undesired duplicate image appearing a fraction of an inch to one side of the desired image, due to reception of a reflected signal along with the signal coming directly from the television station. The remedy involves using a receiving antenna adjusted so it will receive signals coming over only one path.

gilbert. Electromagnetic unit of magnetic potential. Expressed in ergs per unit pole. It is the unit of magnetomotive force. Related to ampere turns as follows: 1 ampere turn equals 0.4 x pi gilberts.

gimmick. A small capacitor formed by twisting two insulated wires together so that the insulation forms the dielectric.

glass-type tube. A vacuum tube or gaseous tube having a glass envelope or housing.

glow discharge. A silent, luminous discharge of electricity through a gas at low pressure.

glow-discharge amplifier. Experimental tubes of theoretical interest because of the larger power which can be handled by a tube containing gas. The ordinary grid in a gas tube can prevent starting of a discharge, but once the discharge is started, the grid loses nearly all of its control. Negative grid voltage will not stop the discharge.

glow-discharge tube. A tube in which conduction is by ions and electrons moving between electrodes.

glow-discharge voltage regulator. A gas tube that varies in resistance between 5,000 and 30,000 ohms (depending on the value of the applied voltage) and maintains a nearly constant voltage when connected across a mildly varying voltage source. Often called "VR tube."

glow lamp. 1. A lamp in which light is produced by a glow discharge between two electrodes in an evacuated envelope into which a small quantity of gas such as neon or argon has been introduced. 2. A gas-discharge tube serving as a concentrated source of light whose brightness varies in proportion to current flow. Used in variable-density sound-on-film recording.

Glow Lamp

glow potential. The voltage at which a glow discharge begins in a gas-filled electronic tube. Sparking potential. Striking voltage.

glow tube rectifier. A cold-cathode gas-discharge tube in which the electrodes differ widely in size to provide unidirectional current flow. A point-plane rectifier. Examples are the BH rectifier tube and the more modern 0Z4 cold-cathode gaseous rectifier.

GMT. Abbreviation for Greenwich Mean Time.

goniometer. In radio, an instrument used for determining the direction or angle at which signals are arriving from a transmitting station.

graded filter. A power supply filter in which connections to the output stage of the receiver or amplifier are made at or near the filter input. Requirements of the last stage for purity of DC are less critical because of its low gain and absence of possible further amplification of hum.

gradient. The space rate at which a variable quantity increases or decreases.

gram. Metric unit of mass or weight. One pound is equal to 454 grams.

granular carbon. Small particles of carbon, used in carbon microphones.

graph. A pictorial presentation of the relation between two or more variable quantities.

graphechon. A specially-designed electron "memory" tube, useful in radar and computer applications. Employs iconoscope principles whereby electrical signal information is stored and recovered. Signals can be stored and recovered at different scanning rates.

graphite. One of the crystalline forms of carbon. It is a fair conductor and is used in the construction of carbon resistance elements. Also used in powder form or mixed with grease as a lubricant.

grass. A pattern resembling blades of grass, superimposed on the screen of cathode-ray tubes used in radar, television or panoramic (scanners) adapter equipment.

green gun. One of three guns in a three-gun color CRT. It provides the beam which strikes the green emitting phosphor dots of the screen mosaic.

grid. An electrode mounted between the cathode and the anode of a radio or electronic tube to control the flow of electrons from cathode to anode. The grid electrode is usually either a cylindrical-shaped wire screen or a spiral of wire through which electrons can readily move.

grid bias. The dc voltage applied to the control grid of a vacuum tube to make it negative with respect to the cathode. Also called C bias.

grid-bias cell. A small cell used in the grid circuit of a vacuum tube to provide C bias voltage.

grid-cathode capacitance. The capacitance between the grid and the cathode inside a vacuum tube.

grid characteristic. The curve obtained by plotting grid-voltage against grid-current values of a vacuum tube.

grid circuit. The circuit between the grid and cathode of a vacuum tube. The input circuit of the tube.

grid clip. A spring clip to make a connection to the top (grid) cap terminal on some vacuum tubes.

grid-controlled rectifier. A triode gas rectifier tube.

grid-control tube. A gas thermionic vacuum tube having an external grid control.

grid current. The current passing to or from a grid through space inside a vacuum tube and measured in the input circuit. Consists of electron current to a positive grid.

grid detection. Detection taking place due to the action of the grid circuit of a vacuum tube, as in a grid-leak capacitor detector. Detection depends upon the nonlinearity of the characteristic.

grid-dip meter. A vacuum-tube oscillator having in its grid circuit a sensitive current-indicating meter that dips (reads lower current) when energy is drawn from the oscillator by a coupled resonant circuit tuned to the oscillator frequency.

grid-dip oscillator. See grid-dip meter.

grid driving power. The wattage applied to the grid circuit of a tube during tube functioning.

grid emission. Electron or ion emission from a grid in a vacuum tube.

grid-glow tube. A cold-cathode gas-filled tube. One or more grids are used to control the flow of current. During operation, there is a luminous glow near the grids, due to ionization of the gas. Hence the name grid-glow tube.

grid leak. A resistor used in the grid circuit of a vacuum tube to provide a discharge path in parallel with the grid coupling capacitor. The value of the resistor determines the average value of the developed grid bias.

grid-leak capacitor. A small capacitor, usually mica, connected in a vacuum tube grid circuit with a resistor. Together, they produce C bias.

grid-leak capacitor detector. A type of detector circuit in which audio-frequency voltage developed across a grid resistor causes corresponding audio-frequency plate-current changes.

grid modulation. Modulation produced by introduction of the modulating intelligence into the grid circuit of any tube in a transmitting system in which the carrier-frequency wave is present.

grid-plate capacitance. The capacitance between the grid and the plate within a vacuum tube.

grid return. The lead or connection which provides a path for electrons from the grid circuit or C bias battery to the cathode.

grid suppressor. A resistor connected to the control grid to prevent parasitic oscillation due to feedback through the grid-plate capacitance.

grid swing. The total grid signal voltage variation from the positive to negative peaks.

grid voltage. The voltage between grid and cathode. A loose term applied to grid signal voltage or to grid bias voltage or to their combined voltage.

grid-voltage supply. The means for supplying a bias potential to the grid of a vacuum tube.

grid wires. In the Lawrence Chromotron single-gun color picture tube, wires stretched across the screen in back of the color phosphor strips. A sub-carrier voltage of of 3.58 mc is applied between pairs of these grid wires which causes the beam to deflect upward and downward periodically striking the three color strips in sequence. At the same time, the three primary video signals are applied to the single grid, but gated in synchronism with the vertical deflection.

grille. An arrangement of wood or metal bars placed across the front of the loudspeaker in a radio receiver for protective purposes and to enhance the cabinet.

grille cloth. A loosely woven cloth stretched behind the loudspeaker grille of a radio receiver to keep dust and other foreign matter out of the loudspeaker, as well as to conceal the loudspeaker diaphragm. Sound waves travel unimpeded through this cloth.

grommet. An insulating washer, usually made of rubber or a plastic material, used to prevent a wire from touching the sides of the chassis or panel through which it passes.

groove. The track cut in a phonograph record or other medium by the stylus during sound recording, or in which a phonograph needle rides during play-back.

ground. A connection, intentional or accidental, between an electric circuit and the earth or some conducting body or chassis serving in place of the earth.

ground absorption. Transmitted radio power dissipated in the ground due to dielectric loss.

ground clamp. A metal strap or clamp used for making a good electrical connection to a ground rod or grounded pipe. The clamp has a screw terminal or soldering lug to which the ground wire of a radio can be attached.

ground-controlled approach. A method of landing aircraft during conditions of poor visibility. Precise instructions are transmitted to the pilot by radio, based on the findings of a radar ground station. Abbreviated, GCA.

grounded. Connected to earth or to some conducting body that serves in place of the earth.

grounded-grid amplifier. A circuit in which the input is applied to the cathode rather than to the grid of a triode tube. The grid is grounded and shields the input from the output circuit to prevent oscillation.

ground-plane antenna. A type of vertical transmitting or receiving antenna used primarily for shortwave and VHF (very high frequency) communications. A groundplane antenna normally consists of a quarter-wave vertical element and four horizontal radial elements spaced 90° apart and mounted at the base of the vertical element. Antennas of this type are non-directional and have a low angle of radiation.

ground potential. The potential with respect to the ground or earth. It is usually zero, but can be of some other value as in an AC-DC radio receiver.

ground-reflected wave. The component of the ground wave that is reflected from the ground.

ground resistance. A value expressing the resistance offered to radio waves in traveling from the transmitting antenna through the ground system into the earth.

ground-return circuit. A circuit that is completed by utilizing the earth as a conductive path.

ground system. That portion of an antenna system associated with the ground and including the ground itself.

ground wave. A radio wave that is propagated near or at the surface of the earth and is affected by the resistance of the ground.

ground wire. A conductor leading from radio equipment to an electrical connection with the ground.

growler. An electromagnetic device used for locating short-circuited coils in dynamo, genemotor or motor armatures.

guard band. A narrow band of frequencies provided between adjacent channels in certain portions of the radio spectrum to prevent interference between stations.

gutta-percha. A natural vegetable gum similar to rubber; used principally as insulation for wires and cables.

guy anchor. The buried weight or mass to which the lower end of a guy wire is attached.

guy wire. A wire used to brace the mast or tower of a transmitting or receiving antenna system.

G-Y signal. A green minus luminance, color-difference signal used in color TV. See color-difference signal.

H

h. or hy. Abbreviation for henry, the unit of inductance.

hairpin pickup coil. A hairpin-shaped, single turn coil used in v.h.f. work to transfer energy from an r.f. generator, oscillator, amplifier or transmitter to an antenna lead-in or to a succeeding stage.

hairpin tuning bar. A hairpin-shaped metal bar inserted between the two halves of a doublet antenna. It can be slid in or out to vary the electrical length of the antenna.

halation. Ring of illumination surrounding impact point of electrons on a fluorescent screen.

half cell. An electrode submerged in a suitable electrolyte and used for measuring single electrode potentials.

half-power frequencies. The two values of frequency on the sloping shoulders of an amplifier response curve at which the voltage is $1/\sqrt{2}$ or 70.7% of the mid-band value. Used in characterizing amplifier performance.

half-wave antenna. An antenna whose length is approximately equal to one-half the wavelength to be transmitted or received.

half-wave dipole. A straight ungrounded antenna substantially one-half wavelength long.

half-wave line. A transmission line having an electrical length equal to one-half the wavelength of the signal to be transmitted or received.

half-wave rectification. Rectification of only one-half of each alternating-current cycle into unidirectional current.

half-wave rectifier. A radio tube or other device which converts alternating current into pulsating direct current by allowing current to pass only during one half of each alternating current cycle. A half-wave rectifier tube contains only one diode.

half-wave transmission line. See half-wave line.

half-wave vibrator. Used in battery-operated power supply for cars or boats. The unit has one contact on the electromagnet and feeds unidirectional intermittent current, through a transformer, usually to a half-wave rectifier.

halo. A small aura of light surrounding the spot on a fluorescent screen.

ham. A term applied to licensed radio operators who operate their stations as a hobby, rather than for commercial purposes. See amateur.

Handy-Talkie. Registered trade-mark of Motorola, Inc. for a portable two-way radio communication unit.

hand microphone. A microphone designed to be held in the hand.

hangover. A term used to describe the faulty reproduction of bass notes from a loudspeaker. A blurring effect in sound caused by continuing vibration of a speaker cone after the original signal has stopped.

Hand Microphone

hard-drawn copper wire. Copper wire that has not been annealed after work hardening during drawing, thus providing greater tensile strength.

hard rubber. A rubber compound used for electrical insulation or as a dielectric. It is brittle and has little tensile strength.

hard tube. A vacuum tube that has been evacuated to a high degree.

harmonic. A sinusoidal wave that is an integral multiple of the fundamental frequency which is called the first harmonic. Also any function which repeats itself.

harmonic analysis. A mathematical method. The operations sometimes performed by a machine, for determining the relative amplitudes of the harmonics of a complex wave.

harmonic analyzer. An instrument that measures the component pure sine waves of a complex wave.

harmonic antenna. An antenna whose length is an integral multiple of a wavelength or a half-wavelength with which it is used.

harmonic attenuation. The elimination of a harmonic component by use of a pi network in which the shunt reactances are tuned to zero for the frequency to be eliminated.

harmonic component. Any of the components (simple sinusoidal quantities) into which a periodic quantity may be resolved.

harmonic content. The degree or numbers of harmonics in a fundamental complex frequency output.

harmonic detector. A voltmeter circuit that measures only a particular harmonic of the fundamental frequency.

harmonic distortion. A form of distortion, usually serious in audio amplifiers, in which harmonics of the input signal are produced within the amplifier and appear in the output along with the amplified input signal.

harmonic filter. An electronic circuit designed to attenuate harmonics in a particular piece of electronic equipment. See harmonic attenuation.

harmonic generator. A vacuum tube or other generator which produces an alternating current having many strong harmonics.

harmonic suppression. The prevention of harmonic generation in an oscillator by reducing the non-linearity at the operating range. This is often accomplished by shunting the grid-cathode terminals with a resistor.

harmonic wave analyzer. An instrument that provides a means for determining the harmonic content of an AF, RF, or AC output. See harmonic analyzer.

harness. Wires and cables so arranged and tied together that they may be inserted and connected or removed after disconnection, as a unit.

Hartley oscillator. A vacuum tube oscillator circuit identified by a tuned circuit which employs a tapped winding connected between the grid and plate of the vacuum tube, with the tap going to the cathode.

hash. Noise signals produced by an electrical, electronic or mechanical vibrator.

Hay bridge. A form of impedance bridge having two opposite resistance arms, a third containing L and R in series and a fourth containing C and R in series.

Hazeltine neutrodyne circuit. An early form of neutralized radio-frequency amplifier circuit. The effect of feedback due to grid-plate capacitance was cancelled out by a capacitor outside the tube. Circuit made obsolete by development of screen grid tubes.

head. The recording head in a disc, tape or wire recorder.

headphone. A small telephone receiver, used either singly or in pairs for reception.

headphone adapter. A device that slips under the power output tube, or is otherwise connected to a radio receiver, and provides terminals to which headphones can be connected.

head receiver. A telephone receiver designed to be held to the ear by a headband.

headset. A pair of headphones attached to a headband to hold the phones snugly against the ears.

Headset

heater. An electric heating element for supplying heat to an indirectly heated cathode in an electron tube.

heater current. The current flowing through a heater serving an indirectly heated cathode.

heater voltage. The voltage between the terminals of a filament used for supplying heat to an indirectly heated cathode.

heating element. A complete wire-wound resistor, including terminals and insulating supports, as used in electric heating devices.

heating of anode. A factor of importance in determining the rating of tubes. An anode is heated by radiation from the cathode and by absorption of the kinetic energy of electrons which arrive at the plate.

heating of grid. A factor in determining the rating of tubes. A grid is heated by radiation from the cathode and to a smaller extent, from the anode. Grids, after a time, become coated with emitting materials from the cathode. Therefore, the grids must be kept below emitting temperature—a limitation not imposed on anode temperatures.

heating time of cathodes. The interval after closing the cathode circuit, before a tube is ready to operate. This is longer for indirectly heated cathodes than for filaments; still longer for gas tube cathodes (not mercury vapor types).

heat loss. Power dissipated as heat.

heat waves. Infra-red radiation. Similar to radiowaves, but of higher frequency.

Heaviside layer. A layer of ionized gas which scientists believe exists in the region between 50 and 400 miles above the surface of the earth, and which reflects radio waves back to earth under certain conditions. Also called the Kennelly-Heaviside layer.

height control. The control in a television receiver that adjusts picture size in a vertical direction.

Heising modulation. A method of modulating a carrier wave in which the plates of both the radio-frequency amplifier and modulator tubes are fed through a common inductor of high impedance.

helical. Having the shape of a helix or coil. Spiral.

helical path. Path traversed by a charged particle which does not enter a magnetic field at right angles. If it does so, the helix degenerates into a circle.

helium. A light gaseous element used as a filling in some types of tubes.

helix. A single-layer, spiral-wound coil; usually having an air core. Helix-type elements are frequently used in VHF and UHF antennas.

henry. The practical unit of self-inductance or mutual inductance. The inductance in which a current changing its rate of flow one ampere per second induces an electromotive force of 1 volt. Abbreviated hy, or h.

heptode. A seven-electrode vacuum tube.

hermetically sealed. Air-tight sealed.

Hertz antenna. An ungrounded antenna.

heterodyne. Pertaining to the production of a difference frequency (beat) by combining two frequencies.

heterodyne detector. A radio receiver employing the heterodyne system of reception for signals.

heterodyne frequency. The beat frequency, which is the sum or difference frequency of two signals.

heterodyne frequency meter. See heterodyne wavemeter.

heterodyne harmonic analyzer. A circuit in which a complex input voltage is examined by beating it with a variable frequency oscillator usually in a balanced modulator. In one variety the sum frequencies are fed to fixed filters, amplified, detected and read on a meter. In another type the difference frequencies, coming from a square-law detector tube, are adjusted by tuning the oscillator so that each in turn is so low that a DC milliammeter will respond to the output with a needle deflection proportional to the amplitude of the difference frequency.

heterodyne oscillator. A variable frequency local oscillator. The output is mixed with RF input to produce an intermediate frequency which, like the RF, is modulated.

heterodyne reception. The process of receiving radio waves by combining a received radio-frequency voltage with a locally generated alternating voltage to produce a beat frequency that is more readily amplified. *Syn.:* beat reception.

heterodyne wavemeter. A wavemeter that beats or combines the frequency of its internal oscillator with a received r.f. frequency, the audible combination being zero beat, to determine the frequency of the investigated signal. Also called heterodyne frequency meter.

heterodyne whistle. A steady squeal heard in a radio receiver due to a beat formed by heterodyne interference between stations having nearly equal carrier frequencies.

hexode. A six-electrode vacuum tube.

h-f, HF. Abbreviations for high-frequency, usually taken to mean from 3 to 30 mc.

high-angle radiation. That lobe of radiation from a transmitting antenna which is reflected from high ionized layers and recombines with the ground wave to produce fading.

high band. In television, channels 7-13, 174-216 mcs.

high definition. The television or facsimile equivalent of audio high fidelity. That is, the reproduced image contains all picture elements, accurately reproduced—such that each detail is clearly visible.

high efficiency amplifier. A linear amplifier used in transmission which employs variation of the impedance of the load. Two tubes coupled by a quarter-wave filter are used in the final stage. One supplies the entire power for the load up to carrier power level (modulation amplitude negative). The second tube increasingly supplements the first as the power increases (modulation amplitude positive). Known as the "Doherty Amplifier."

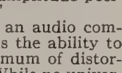
high-fidelity. (Also hi-fi.) A term applied to an audio component, amplifier, or system. Ideally, it is the ability to reproduce faithfully, that is, with a minimum of distortion, the full audio range of frequencies. While no universal standards have been set up, this range is generally agreed to be approximately 20-20,000 cycles. However, the term is often loosely applied to units whose range falls short of these limits.

high-fidelity receiver. A radio receiver capable of receiving modulated radio frequency carrier waves whose modulating frequencies range from approximately 20-20,000 cycles, and of reproducing these frequencies faithfully See high-fidelity.

high frequency. A frequency in the band extending from 3 to 30 megacycles. See radio spectrum.

high-frequency choke. A radio frequency choke as distinguished from an audio (low frequency) choke.

high-frequency trimmer. In a superheterodyne receiver, the trimmer capacitor which controls the calibration of a tuning circuit at the high-frequency end of a tuning range.



RF Choke

high-level detector. Power detector, linear detector. A detection process where the voltage is so high that the e-i characteristic may be treated as a straight line or two intersecting straight lines.

high-level modulation. Modulation introduced in the last radio stage, or at a point in a system connected to the antenna or ultimate output.

high-mu tube. A vacuum tube having a high amplification factor. Used for voltage amplification.

high-pass filter. A filter designed to pass currents at all frequencies above a desired frequency while attenuating the frequencies below the desired frequency.

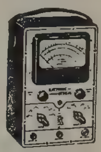
high Q. Having a high ratio of reactance to effective resistance. Factor determining coil efficiency.

high-resistance voltmeter. A voltmeter having a resistance of 10,000 ohms per volt or higher. Draws little current from the circuit in which a measurement is made.

high-tension. High voltage.

high-vacuum rectifier. A vacuum-tube rectifier which has a vacuum instead of a gaseous "filler."

high-vacuum tube. An electron tube that has been evacuated to a low internal pressure, such that its electrical characteristics are not affected by ionization of the small amount of gas in the tube. See getter.



Voltmeter

high-voltage regulator. In color TV, a circuit which regulates the high voltage output.

hill-and-dale recording. A type of phonograph recording in which the cutting stylus of the sound recorder moves up and down rather than from side to side during recording. Also called vertical recording.

hinge coupler. An inductive-type coupler which has one winding movable toward or away from the other by means of a pivot or hinge, thus permitting convenient adjustment of the flux coupling or mutual inductance of the windings.

H. network. A network composed of five impedance or resistance sections so connected as to resemble the letter "H."

hold controls. In a television receiver, two manually adjusted controls that change the frequencies of the oscillators in the horizontal and vertical sweep circuits.

hole. An atom temporarily having less than its normal number of electrons and acting as a positive charge. The movement of such "holes" is often used in describing transistor operation.

homing device. 1. A radio compass so connected to a panel meter that deflection right or left from center indicates corresponding deviation of the plane from its course. 2. An airplane radio device that guides an aircraft to an airport or to the location of the transmitter.

honeycomb winding. A special type of coil winding, so designed as to keep distributed capacity at a minimum. The winding resembles a basket-weave pattern. Also called lattice winding.

hookup. A diagram showing circuit connections for radio or electrical equipment.

hookup wire. Usually tinned and insulated No. 18 or 20 soft drawn copper wire. Used in wiring radios, TV sets, switchboards, etc. May be solid or stranded.

hop. An excursion of a radio wave from the earth to the ionosphere and back to earth in traveling from one point to another.

horizontal angle of deviation. For transmitted radio wave, the horizontal angle between the great-circle path and the direction of departure or arrival.

horizontal blanking. The pulse which cuts off the electron beam while it is returning from the right side to the left side of the screen of a cathode-ray tube.

horizontal centering control. A control provided in a television receiver or cathode-ray oscilloscope to shift the position of the entire image horizontally.

horizontal convergence control. In color TV, the control used to adjust the amplitude of the horizontal dynamic convergence voltage.

horizontal deflecting electrodes. The pair of electrodes that serve to move the electron beam horizontally from side to side on the fluorescent screen of a cathode-ray tube employing electrostatic deflection.

horizontal dynamic convergence. In color television, voltages added to the steady convergence voltage to keep the spot in register.

horizontal dynamic focus. In color television, voltages added to the focus control circuit to keep the spot in focus.

horizontal drive control. See drive control.

horizontal frequency. In television, the number of times per second the spot sweeps across the screen in a horizontal direction; presently standardized in the United States at 15,750 sweeps per second.

horizontal flyback. In a television system, the right-to-left return motion from the end of one scanning line to the beginning of the next. Also called horizontal retrace or line flyback.

horizontal hold control. The control that changes the frequency of the horizontal sweep oscillator in a television receiver.

horizontal linearity. Controls the width at the left hand side of the screen of a picture tube. The control for adjusting this is usually mounted on the back of the television set.

horizontal lock. A circuit in a television receiver used to maintain horizontal synchronization.

horizontal polarization. Transmission of radio waves in such a way that the plane of electrical polarization is horizontal; parallel to the surface of the earth.

horizontal resolution. The definition or clarity of a television image in a horizontal line.

horizontal retrace. Horizontal flyback.

horizontal sweep. The scanning motion from left to right across a picture or screen being televised.

horizontal synchronizing impulse. The impulse transmitted after each line is scanned in a television system, for the purpose of keeping the receiver in synchronism with the transmitter. Also called line synchronizing impulse.

horn. An energy-transferring device in the shape of a horn with the energy producing device located at its throat.

horn radiator. A metal horn used as a guide for radiated waves.

horsepower. A unit of power equal to 550 foot-pounds per second, and electrically equivalent to 746 watts.

hot. Connected, alive, energized. Said of a wire, terminal, or any ungrounded conductor. Not grounded.

hot-cathode tube. A vacuum or gaseous tube in which electronic emission takes place from a cathode that is indirectly heated by a filament. This permits the use of an AC voltage on the filament without hum effects.

hot-wire ammeter. An instrument in which current is measured by sending it through a fine wire. The resulting expansion or sag of the wire is magnified to cause deflection of the meter pointer.

howl. An undesirable prolonged sound produced by a radio receiver or audio-frequency amplifier system because of either electrical or acoustical feedback. May be demonstrated by placing telephone receiver near transmitter.

hp. Abbreviation for horsepower.

H-pad. An attenuation network in which the elements are arranged in the form of the letter H.

hue. The identification of a color. Neither black nor white nor any of the various values of gray are considered hues.

hue control. See phase control.

hum. A low and constant audio frequency, usually either 60 or 120 cycles. Hum may be heard in the background of a received radio or television program or in the output of an audio amplifier. When hum is present in the video circuit of a TV receiver it creates dark horizontal bars, picture distortion, or both. Hum is most frequently caused by a faulty filter capacitor in the power supply or heater-cathode leakage in a tube.

hum-bucking coils. A coil wound on the field coil of a speaker and connected in series with the voice coil. Voltage induced by hum in the field coil is fed into the voice coil in such a direction as to buck the effect of hum.

humming. Hum produced in transformers by ac currents caused by chatter in the laminations.

hum modulation. Hum that is heard in a receiver only when a station is tuned in.

hydrometer. An instrument used to determine the specific gravity of liquids. Hydrometers are employed to determine the specific gravity of the electrolyte in a storage battery and hence the state of charge of the battery.

hygroscopic. Readily absorbing and retaining moisture.

hypernik. An alloy of 50% iron, and 50% nickel which has been given a special heat treatment. It has initial permeability close to that of permalloy; maximum value of 160,000 at flux density of 5000 lines/cm^2.

Hypex horn. A horn having throat-resistance characteristics such as to give a rise in response at low frequencies.

hysteresis. 1. Generally, a lag. 2. Magnetic hysteresis occurs when a ferromagnetic substance is subjected to a varying magnetic field. 3. Electric hysteresis occurs when a dielectric material is subjected to a varying electric field.

hysteresis distortion. An effect on the secondary voltage wave of a transformer due to distortion in the primary current. If the voltage impressed upon the primary, and the resultant flux—vary sinusoidally, the current in the secondary will not be sinusoidal because of varying permeability of the iron in the core.

hysteresis loop. Graphically, a closed curve in the form of two esses (s) joined at the ends on a B-H diagram. The esses (s) represent the magnetization curves as the magnetizing force goes from maximum with one polarity to maximum with the other. The esses (s) do not coincide as a result of lag in the magnetizing process. Thus at zero magnetizing force there is residual magnetism.

hysteresis loss. Energy loss in a magnetic substance exposed to a constantly changing magnetic field. The loss is due to internal friction, and appears as heat. It is proportional to the area enclosed in the hysteresis loop.

hysteresis synchronous motor. A type of motor whose speed is controlled by the frequency of the operating current. Motors of this type are used in professional tape recorders, transcription turntables, and other devices where extremely constant operating speed is required.

I

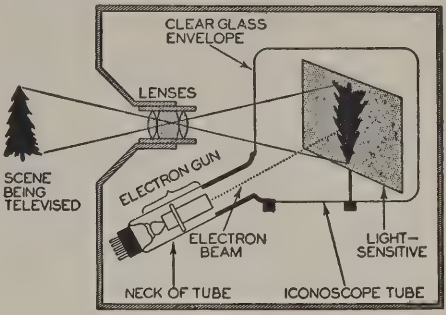
I. Symbol to designate current.

$_b$I See I_p.

C. Abbreviation for internal connection. Used on tube base diagrams.

I_p. Symbol to designate plate current of a vacuum tube. Also I_b.

ICAS. Abbreviation for Intermittent Commercial and Amateur Service. Used in reference to the power rating of transformers, tubes, and other components. When numerical rating is preceded or followed by ICAS, this means that the rating does not apply to continuous, day-in, day-out duty, but rather to intermittent operation.



Iconoscope

iconoscope. A cathode ray television pick-up tube for use in electronic television cameras. It converts each tone value of the scene being televised into a corresponding electrical impulse. Scanning of the image is accomplished by sweeping an electron beam rapidly back and forth across the light-sensitive mosaic screen.

iconoscope camera. TV camera with an iconoscope tube.

icw. Abbreviation for interrupted continuous waves.

ID. Abbreviation for inside diameter.

ideal rectifier. Basis for assumptions in rectifier calculations. A rectifier with no back current (infinite back impedance) and no forward voltage drop (infinite forward conductance).

idler pulley. A type of pulley used in tuning dial drive mechanisms. An idler pulley serves to tighten or change the direction of a dial cord, but does not in itself drive any tuning component.

IF, i.f. Abbreviation for intermediate frequency. Used with special reference to superheterodyne receivers.

IFF. Identification-Friend-or-Foe. A system of challenge and response developed for use with radar equipment. Involves transmission and reception of coded signals both by the challenger and by the target craft.

ignition interference. Noise produced by sparks or other ignition discharges. The source may be a car, motor, furnace ignition, or faulty equipment in which there are loose contacts or connections. Can be stopped at the source by use of high resistance or capacitors.

ignitor. An electrode that is partly immersed in the mercury-pool cathode of an ignitron tube and used to start ignitron operating. Made of high-resistivity material, such as silicon carbide.

ignitron. A mercury-vapor rectifier tube with a mercury cathode. Starting is by an ignitor rod.

image. 1. An optical counterpart of an object. 2. A fictitious electrical counterpart of an object. 3. The scene reproduced by a television or facsimile receiver.

image antenna. The fictitious electrical counterpart of an actual antenna, acting mathematically as if it existed in the ground directly under the real antenna.

image dissector. A cathode ray television pickup tube. Construction and operating principles are different from those of the iconoscope, but serves essentially the same purpose of converting a scene into corresponding electrical impulses.

image distortion. A reproduced image in a television receiver that does not appear the same as the object scanned by the television camera.

image frequency. A radio signal appearing as an unwanted component in the output of a receiver, and whose frequency is either lower or higher than the oscillator by an amount exactly equal to the frequency difference between the receiver oscillator and tuning frequencies. If the receiver tuning capacitor tracks at a frequency higher than that of the oscillator, the image frequency is less than the oscillator frequency, and vice versa.

image interference. In a superheterodyne receiver, the condition in which a station broadcasting on the image frequency is heard with the desired station.

image orthicon. A television camera tube combining an image dissector, orthicon and image multiplier.

image ratio. The ratio of the strength of a signal to its image. Used to indicate selectivity of a receiver.

image reconstructor. The receiving cathode-ray tube in a television receiver.

image reproducer. An image reconstructor.

image response. The ability of a superheterodyne receiver to respond to a signal at its image frequency.

impact excitation. Starting of damped oscillations in a radio circuit by a sudden surge such as that produced by a spark discharge. Also called shock excitation.

impedance. The total opposition that a circuit offers to the flow of alternating current or any other varying current at a particular frequency. Impedance is a combination of resistance and reactance. The symbol for impedance is Z, and the ohm is the unit of impedance.

impedance angle. Angle of the impedance vector with respect to the resistance vector. Represents voltage lag or lead with respect to current.

impedance bridge. A device to measure the combined resistance and reactance of a component part of circuit. See Hay, Maxwell and Wien bridges.

impedance coil. A choke coil. An inductor.

impedance coupling. Coupling by means of an impedance connected between two circuits.

impedance match. The condition in which the impedance of a component or circuit is equal to another impedance to which it is connected. Impedance matching is important for maximum power transfer, minimum reflection and, since reflection varies with frequency, minimum distortion.

impedance-matching transformer. A transformer used to provide an impedance match between two or more circuits. Since the impedances of the windings of a transformer are proportional to the number of turns in the windings, the desired impedance ratio can be obtained in manufacture by controlling the number of turns in the windings.

implosion. A bursting inwards; opposite of explosion. Since cathode-ray and television picture tubes have a high vacuum and are often large in size, damage to their envelopes may cause a violent inrush of air and a resultant implosion.

impregnated. Having spaces filled with a dielectric such as paraffin, shellac, varnish, etc.

impressed voltage. The voltage applied to a circuit or device.

impulse. A momentary surge in voltage or current.

impulse separator. In a television receiver, the circuit that separates the horizontal from the vertical synchronizing impulses in the received signal.

incandescent lamp. A lamp that emits light when electrical current flows through its filament. The current causes the filament to become white-hot and thus to produce light. Oxygen is removed from the glass envelope of the lamp to prevent the filament from "burning up."

inclination. The angle which a line or surface makes with the horizontal. Thus, magnetic inclination, also called magnetic dip, is the angle that the magnetic field of the earth makes with the horizontal at a particular location.

inclined coil meter. AC-DC meter. A coil, mounted at 45° to the axis of a shaft, causes a torque on a sheet of iron mounted on the shaft at right angles to the plane of the coil. Rotation is opposed by springs around the shaft.

inclinometer. An instrument for measuring inclination.

increment. A (small) change in the value of a variable.

incremental permeability. The permeability effective in a core as a result of an AC fluctuation in current superimposed on a DC current. The value of the incremental permeability is low compared to the normal case because of partial saturation of the core. The AC current produces a small hysteresis loop about the operating point.

index counter. A type of indicator on tape recorders. Index counters indicate the amount of tape footage recorded or played to permit easy location of particular selections or portions of selections of a tape.

index of modulation. The modulation factor in FM.

indicating lamp. A small lamp, generally used to signal a condition of a circuit or component.

indicator. An instrument used to detect the presence of an electrical quantity without necessarily measuring it accurately. Examples: the electron ray tube and the neon bulb.

indirectly heated cathode. A cathode to which heat is supplied by an independent heater element in a thermionic tube. Also called equipotential cathode or unipotential cathode.

indirect view TV receiver. A type of television receiver where the viewing image is projected by an optical system from the cathode-ray tube to a larger screen.

indirect wave. The sky wave, received after reflection from ionosphere layers.

indoor antenna. A receiving antenna system located entirely inside a building.

induced. Produced as a result of exposure to the influence or variation of an electric or magnetic field.

induced charge. An electrostatic charge produced on an object by an electric field in the vicinity.

induced current. A current due to an induced voltage.

induced voltage. A voltage produced in a circuit by changes in the number of magnetic lines of force which are linking or cutting across the conductors of the circuit.

inductance. That property of a coil or other radio part which tends to prevent any change in current flow. Inductance is effective only when varying or alternating currents are present; it has no effect whatsoever upon the flow of direct current. Inductance is measured in henrys.

inductance bridge. An instrument similar to a Wheatstone bridge; used to measure an unknown inductance by comparing it with a known inductance.

inductance-tube modulation. A method of modulation employed in frequency-modulated transmitters. See reactance tube.

induction. The process by which an object is electrified, magnetized, or given an induced voltage by exposure to a magnetic field.

induction coil. A device with some form of interrupter for changing direct current into alternating current.

induction compass. A compass whose indications depend on a coil revolving in the magnetic field of the earth. Also known as earth inductor compass.

induction field. The portion of the electromagnetic field of a transmitting antenna which acts as if it were permanently associated with the antenna. The radiation field leaves the transmitting antenna and travels through space as radio waves.

induction heating. Industrial and laboratory processes based on eddy currents. RF power is generated by spark gap or tube oscillatory circuits. The power is coupled by highly efficient coils into the work which serves as a secondary or load. The process usually takes place in a vacuum or controlled atmosphere. The purpose may be that of melting, welding or brazing, or heating.

induction motor. An alternating current (only) electric motor in which the rotor consists of shorted bars parallel to the axis. These are swept around by a rotating magnetic field.

inductive circuit. A circuit containing largely inductive reactance, rather than capacitive reactance or simply pure resistance.

inductive coupling. A form of coupling in which energy is transferred from a coil in one circuit to a coil in another circuit by induction. Magnetic lines of force produced by the flow of current through one coil cause an a.c. voltage to be induced in the other coil.

inductive feedback. Feedback of energy from the plate circuit of a vacuum tube to the grid circuit through an inductance or by means of inductive coupling.

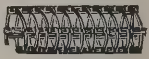
inductive load. A load that is predominantly inductive. Also called lagging load.

inductive reactance. Reactance due to the inductance of a coil or other part in an alternating current circuit. Inductive reactance is measured in ohms, and is equal to the inductance in henrys multiplied by the frequency in cycles, times the number 2π. Inductive reactance therefore increases with frequency.

inductor. A circuit component designed so that inductance is its most important property. Also called a coil.

inertance. In acoustics, the equivalent of inductance.

inert gas. One of a group of chemically inert gases, including helium, neon, argon, krypton, and xenon. Also called noble gas and rare gas.



Inductor

infinite baffle. A type of speaker enclosure which is completely sealed except for the speaker cut-out.

infinite impedance detector. A circuit using a triode tube in which the load is a resistor connected between cathode and ground. RF is bypassed by a parallel capacitor. With this arrangement the grid is always negative so that the tube presents an infinite impedance to the input.

infinite line. An imaginary transmission line that has all the characteristics of an ordinary line, but is infinitely long.

infrared. The range of invisible light radiation frequencies lying between visible red and radio waves. Heat rays. See electromagnetic spectrum.

infrasonic. Having a frequency below the audible range. Also called subsonic. Frequencies above the audible range are called ultrasonic or supersonic.

injection grid. Grid of a vacuum tube that exercises reasonable control over the electron stream without causing appreciable interaction between the screen grid and control grid.

in-line tape system. A method of stereo recording and playback in which the tape heads are in vertical alignment. In-line heads are also called stacked heads.

in phase. The condition existing when waves pass through their maximum and minimum values of like polarity at the same instant.

input. 1. The current, voltage, or power that is fed into a circuit or device. 2. The terminals to which the incoming signal voltage is applied.

input admittance. The effect of interelectrode capacitances, (particularly at high frequencies), such that the input circuit is equivalent to a capacitor and resistor (positive or negative) in parallel. The tube becomes an active element between the input and load, so that the type of load determines the equivalent values.

input capacitance. The sum of the direct capacitances between the control grid and the cathode of a vacuum-tube circuit.

input impedance. The ratio between voltage and current at the input terminals of a circuit. Usually it is necessary to insert a coupling network between the source and the load if optimum power transfer is to be assured. Maximum power transfer is obtained when the source and the load or input impedances are equal.

input transformer. A transformer used to transfer incoming energy to the input of a circuit or device.

insertion loss. The ratio (expressed in decibels) of the power delivered before, to the power delivered after, the insertion of an apparatus in a transmission system.

inside spider. A flexible device attached to the voice coil of a dynamic speaker to center it accurately with respect to the pole piece.

instantaneous current value. The amplitude of current in an AC wave at any selected instant in the cycle.

instantaneous disc. A recording disc that can be played back on a phonograph immediately after being cut.

instantaneous recording. A recording that may be used immediately after cutting or embossing, without further processing.

instantaneous voltage value. The amplitude of voltage in an AC wave at any selected instant in the cycle.

in step. In phase.

instrument multiplier. A highly accurate series resistor used to extend the voltage or resistance range of a meter.

instrument shunt. A special type of low-value resistor connected in parallel with a meter to extend its current range.

insulated carbon resistor. A carbon resistor encased in a molded ceramic, fiber, plastic or other insulating material.

insulated wire. A conductor of electricity covered with a nonconducting material.

insulating strength. A measure of the ability of an insulating material to withstand electric stress without breakdown. Also called electric strength and dielectric strength.

insulating tape. Tape impregnated with insulating material, usually adhesive; used to cover and insulate joints or connections in wire or cables. Rubber tape.

insulating varnish. A varnish having good insulating qualities.

insulation. Any non-conductive material used to prevent the leakage of electricity from a conductor. Some common insulating materials are cotton, silk, rubber, glass, mica, ceramic, etc.

insulation resistance. The electric resistance between two conductors separated by an insulating material.

insulator. A device having high electric resistance, used for supporting or separating conductors so as to prevent undesired flow of current between conductors or to other objects.

Insulator

integrating circuit. A circuit in which the voltage amplitude at the output is proportional at any instant to the ratio of the voltage amplitude to the frequency at the input. Usually an RC circuit, used to separate two functions or frequencies.

intelligence signal. Any signal which conveys information, such as voice, music, code, television pictures, facsimile photographs, diagrams, written and printed matter, etc.

intensifier electrode. A third electrode in a cathode-ray tube which imparts additional kinetic energy to the electron beam after it has been deflected.

intensity. A general term now used chiefly to signify the strength or value of a current. The symbol I for current comes from this word.

intensity level. A term used in acoustics to specify the relation of one sound intensity to another. The intensity level is expressed in decibels (db) or volume units (VU).

intensity modulation. Control of the brilliance of the trace on the screen of a cathode-ray tube in conformity with the signal. Also called brilliance modulation.

intercarrier system. A television IF system wherein both audio and video signals go through the same IF stages.

intercommunication system. An amplifier system which provides two-way communication between two or more rooms in a building. Each station in the system contains a microphone and speaker, usually combined as a single dynamic unit; a headphone or telephone receiver is sometimes provided also for private reception of messages. The stations may be connected to each other by wire cables, or may receive and transmit messages through the electric wiring system in the building.

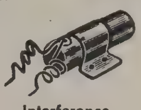
interelectrode capacity. The capacity which exists between two electrodes in a vacuum tube. Although this is usually a very low value, it becomes extremely important when tubes are operated in ultra-high frequency circuits.

interelectrode coupling. Feedback from a tube plate to the grid. In triodes this fixes a limit to the amplification possible without oscillation. The interelectrode capacitance is decreased in the tetrode by use of the screen grid, thus permitting higher amplification.

interference. 1. A variety of effects occurring when two or more wave trains of either light or radio waves arrive at the same point simultaneously. A useful application of this phenomenon is made in heterodyne circuits and beat frequency oscillators, which may be considered as special cases of interference. 2. Undesired radio programs or noises that interfere with reception of a desired signal.

interference eliminator. Any device designed for the purpose of eliminating or reducing interference.

interference filter. A device used between a source of interference and a radio, to attenuate or eliminate noise. Generally consists of a capacitance-inductance circuit which offers a high impedance to noise impulses.



Interference Filter

interference guard bands. Two bands of frequencies provided on either side of a communications band so there will be no interference between stations on adjacent frequencies.

interlaced field. Interlaced scanning.

interlaced scanning. A method of electronic television scanning in which every other line of a frame is covered during one downward sweep of the scanning beam and remaining lines are scanned during the next complete sweep. In the standard U. S. system, the odd and even lines are scanned as separate fields; each field contains 262.5 of the total 525 lines.

interlacing. 1. A method of scanning used in television in which each picture is divided into two complete sets of interlacing lines to reduce flicker. 2. A method of assembling laminations of a transformer, whereby the core pieces are placed in some number combination, front to back to the same edge, thus increasing the magnetic field. Laminations are usually either E or I shaped.

interleaved winding. A method of winding the primary and secondary of transformers, especially audio transformers, so that there is very close coupling between the windings. This close coupling minimizes leakage reactance and results in improved high-frequency response.

interleaving. A color TV term denoting the transmission of separated chrominance and luminance signals within the same range of video frequencies.

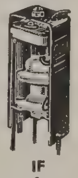
interlock. A safety device which automatically opens the AC supply circuit when the cover (as in a cabinet), or door, which provides access to the circuit, is opened.

intermediate frequency. In superheterodyne reception, a frequency resulting from the combination of the received frequency with the locally generated frequency. Usually equal to their difference.

intermediate-frequency amplifier. That section of a superheterodyne receiver which is designed to amplify signals with high efficiency at a predetermined frequency called the intermediate frequency of the receiver.

intermediate-frequency transformer. A transformer used at the input and output of each intermediate frequency amplifier stage in a superheterodyne receiver for coupling purposes and for providing selectivity. Abbreviated IF transformer or IFT.

intermediate-frequency transformer lead color code. The standard RETMA color code: Plate lead—blue; B plus lead—red; grid or diode lead—green; grid return lead—black. For a full-wave transformer the second diode lead will be green-black.



IF Transformer

intermittent current. A unidirectional current that is interrupted at regular or irregular intervals. Example: the unfiltered output from a half-wave rectifier.

intermittent duty. Non-continuous operation.

intermittent rating. A rating for non-continuous operation.

intermittent reception. A type of radio receiver trouble in which the receiver performs normally for a time, then becomes dead or distorts the programs, with the process repeating itself.

intermodulation. Modulation of the components of a complex wave by each other. The waves produced contain frequencies equal to the sum and difference frequencies of the component frequencies of the original wave.

intermodulation distortion. When a signal containing two or more frequencies is applied to the input of a non-linear device, the output consists of waves having the original frequencies plus additional, new frequencies. These new frequencies are the result of intermodulation distortion in the non-linear device. Undesirable in audio amplifiers. See intermodulation frequencies.

intermodulation frequencies. Sum and difference frequencies generated in a non-linear element. Because the EI characteristic of a tube (or other rectifier) is not straight (non-linear), a sine input wave is distorted at the output. The output contains harmonics. If I of the characteristic is proportional to E and E^2 only, there will be only second harmonics. If I is also proportional to E^3, third harmonics also will be present. The harmonics may be thought of as sums and differences among themselves—there is even zero frequency present. If there are two or more frequencies present in the input, there will be generated harmonics of each, and in addition, all of the sums and differences formed by "mixing" all of these frequencies and harmonics.

internal resistance. The resistance of a battery, generator or circuit component. It acts as a series resistance.

International Morse Code. The code used universally for radio telegraphy, and also used for wire telegraphy in some European countries. Continental Code.

interpolate. To estimate missing values between those which are known.

interpolation. The process of finding the value of a function between two known values by interpolating.

interrupted continuous wave. A continuous wave that is interrupted at an audio frequency to produce an audio-frequency tone modulation. Also ICW.

interrupter. A device, mechanical, electronic or electrical, for opening and closing an electric circuit rapidly and periodically.

interstage. Between stages.

interstage coupling. Coupling between vacuum-tube stages.

interstage transformer. A transformer used to provide coupling between two vacuum-tube stages.

Invar. A nickel-steel alloy used for resistance wire.

inverse feedback. A vacuum-tube circuit arrangement in which a voltage is fed back from the plate circuit to a preceding stage; used in radio-frequency circuits to improve the stability, and in audio-frequency circuits to reduce distortion and thus permit greater undistorted power output. Also called degeneration, negative feedback, and stabilized feedback.

inverse-feedback filter. A resonance bridge circuit used at the output of a high selectivity amplifier, such as an oscillator or wave analyzer. Impedance is adjusted so that the feedback output is zero for the resonant frequency but increases rapidly as frequency departs from this value.

inverse network. An equalizing circuit used to correct unequal frequency transmission. Each impedance unit in the line is balanced with a corresponding admittance unit in the equalizer. Series connections in the one become parallel connections in the other.

inverse peak voltage. The peak-voltage value existing across a rectifier tube during that half of the cycle in which current does not flow. The limiting voltage that a gas or vapor rectifier can stand without breakdown.

inverse voltage. The effective-voltage value existing across a rectifier tube during that half of the cycle in which current does not flow.

inversion. 1. In radiotelephony, one process of producing scrambled speech. 2. In antenna and propagation theory, the condition when the temperature of the air at high altitudes is higher than that of the surface air or of that at some lower altitude.

inverted amplifier. A two-tube vacuum-tube amplifier stage in which the control grids are grounded and the driving excitation is applied between the cathodes.

inverted L antenna. An antenna bent at approximately a right angle with the horizontal section higher than the vertical section, which section, in addition to radiating, also serves as a feeder in many instances.

inverted speech. Scrambled speech.

inverter. An electrical or electronic device for converting direct current into alternating current.

ion. An atom or molecule which has fewer or more electrons than normal. A positive ion is one which has lost electrons, and a negative ion is one which has acquired more electrons than normal.

ionization. The breaking up of a gas atom into two parts, a free electron and a positively charged ion. This process corresponds to the "break-down" of an insulator. Ionization makes a gaseous tube more conductive than an equivalent vacuum tube.

ionization current. Current flow between two oppositely charged electrodes in an ionized gas.

ionization gauge. A pressure gauge used for measuring the degree of vacuum. Operation is based on the quantitative relation between pressure and ionization current in an electron tube.

ionization potential. The voltage required to ionize an atom or molecule.

ionization pressure. An increase in the pressure within a gaseous discharge tube due to ionization of the gas.

ionization time. The time required for formation of a discharge. It is shorter than de-ionization time. Time required for plasma formation in thyratrons is from a fraction of a microsecond to several microseconds. Discharge operation is rapid compared to the speed of temperature response of a filament; thus neon glows are used in strobotrons. There are, however, marked limitation in the use of ions as compared with electrons for high frequency circuits.

ionized layer. A Kennelly-Heaviside layer.

ionosphere. The upper portion of the earth's atmosphere beginning at about 30 miles above the surface of the earth. The ionosphere starts with the E_1 and E_2 layers, commonly called the Kennelly-Heaviside layer. Above this are the F_1 and F_2 layers, sometimes collectively called the Appleton layer.

ion sheath on grid. A positive ion layer which forms around the grid of a gas tube as soon as the discharge is established, and which prevents the grid from functioning as a control device. Application of a negative potential to the grid merely results in the attraction of more positive ions to the sheath.

ion spot. A discoloration at the center of a television cathode-ray tube due to negative ion bombardment. Prevented by use of a beam bender or ion trap.

ion trap. A coil or permanent magnet placed on the neck of the cathode-ray tube for the purpose of removing ions from the electron stream. The magnetic field is able to deflect the electron stream, but has very little effect on the heavier ions. By doing this, it is able to separate the electrons from the ions, preventing the formation of ion spots on the screen.

Ion Trap

IR drop. The voltage drop produced across a resistance R by the flow of current I through the resistor.

IRE. Abbreviation for Institute of Radio Engineers.

I^2R. Power in watts expressed in terms of the current I and resistance R.

I^2R loss. Power loss in transformers, generators, connecting wires, and other parts of a circuit due to current flow I through the resistance R of the copper conductors. Also called copper loss.

iron-core transformer. A transformer in which iron forms part or all of the magnetic circuit linking the transformer windings.

iron loss. Power loss occurring in iron cores of electric machines, coils, transformers, etc., due to hysteresis and eddy currents.

iron pyrites. Sulphide of iron, used in early forms of crystal detectors.

iron-vane instrument. A meter in which the movable element is an iron vane which is drawn into the magnetic field produced by flow of the current being measured.

IS. Symbol designating internal shield. Commonly used in tube-base diagrams to indicate a pin which is connected to a tube's internal shield.

I-signal. The in-phase component of the chrominance signal for color TV.

isochronous circuits. Circuits operating at the same resonant frequency.

isolantite. A high-quality insulating material used in the construction and mounting of radio parts, particularly those employed in ultra-high frequency circuits.

isolating switch. A switch used to isolate a circuit from its source of power.

isolation network. A network inserted in a circuit or transmission line to prevent interaction between circuits on each side of the insertion point. Often a tube is used for this purpose.

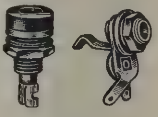
isolation transformer. A transformer with physically independent primary and secondary windings and usually having a 1:1 ratio. Transformers of this type are used to isolate AC-DC type equipment from the AC power line. Servicemen often place an isolation transformer in the AC line of equipment under test so as to prevent shock hazard and damage to test equipment.

isotopes. Variations of a chemical element, each having the same atomic number but differing in atomic weight.

J

j. 1. Abbreviation for joule. 2. Same as i. Common engineering symbol for an imaginary number. Stands for the square root of -1. Also used as an operator to rotate a vector quantity 90° counter-clockwise.

jack. A plug-in type spring terminal widely used in radio apparatus for temporary connections. A connection is made to a jack simply by plugging into it a probe or plug attached to a flexible insulated wire or cable. Some jacks have extra contacts which are opened or closed when the probe is inserted, thereby giving automatic switching action.



Jacks

jamming. Transmission of disturbing radio signals or noise in such a way as to interfere with reception of signals from another station.

JAN specification. Joint Army-Navy specification.

J antenna. A type of half-wave vertical antenna used primarily on the very high frequencies (VHF). It includes a quarter-wave matching section running parallel to and mounted at the bottom portion of the antenna. This gives the antenna an appearance resembling the letter J.

jewel bearing. A natural or synthetic jewel, usually sapphire, used as a bearing for pivot or other movement parts of any delicate instrument, watch, or meter.

jitter. In facsimile, distortion in the received picture. In television, the tendency of several lines or the whole picture to vibrate due to poor synchronization.

Johnson noise. Background noise occurring in radio receivers, resulting from thermal agitation in the grid circuits.

joule. A unit of energy or work. The absolute joule is equal to 10 million ergs. The international joule is equal to the work required to maintain a current of one ampere for one second in a resistance of one ohm. One joule is equal to one watt-second.

Joule's law of heating. The heat produced in a conductor is proportional to the resistance of the conductor, to the square of the current, and to the time.

jumper. A short length of conductor used to make a temporary electrical connection.

junction. 1. A point in a circuit where 2 or more wires are connected. 2. A point in an electrical or magnetic network at which three or more conductors meet.

junction box. A metal or other box into which wires or cables are led and connected.

K

K. 1. Symbol for cathode. 2. Any numerical value that remains constant during a given period. 3. Abbreviation for 1000 used in stating resistor values. Thus, 10K ohms means 10,000 ohms.

kc. Kilocycles per second.

keep-alive anode. An auxiliary electrode in a mercury pool tube. Maintains a DC discharge. Its disadvantage is that it reduces peak inverse voltage.

keeper. An iron or steel bar placed across the poles of a horsehoe magnet. The keeper prevents gradual demagnetization by providing a low-reluctance path for the magnetic circuit.

Kelvin scale. The absolute temperature scale; equal to Centigrade reading plus 273.1.

Kennelly-Heaviside layer. A region of highly ionized air in the ionosphere, at about 30 miles above the surface of the earth. It consists of several layers, which are designated E_1 and E_2, called Heaviside layers. Reflection of radio waves from these layers makes possible long distance transmission.

kenotron. A high vacuum, high-voltage diode tube.

Kerr cell. A device that can be used to convert a varying voltage into corresponding variations in the intensity of polarized light passing through the cell. Used as a light valve in some mechanical television systems.

key. 1. A hand-operated switching device used to send code signals by telegraphy or radio telegraphy. 2. A lever-type switch for making momentary contacts; generally used in test instruments and telephone switch boxes.

key click. Telegraphic radiation that is sent by the signaling key and is not essential for communication.

key-click filter. A filter that attenuates or eliminates key clicks.

keying wave. See marking wave.

keystoning. The production of a keystone-shaped scanning pattern due to the electron beam in the television camera tube being at an angle with the principal axis of the tube.

kickback. The back-electromotive force produced in a coil when the current flow through it is stopped and the magnetic field collapses.

kickback supply. A high-voltage supply of a cathode-ray tube circuit which obtains energy from pulses occurring in the primary of the horizontal sweep output transformer during the retrace period.

kilo-. Metric prefix meaning 1,000.

kilocycle. One thousand cycles. Abbreviated kc. Equal to one thousand cycles per second.

kilohm. Unit of resistance, equal to 1000 ohms.

kilometer. One thousand meters, or approximately 3,280 feet (6/10 mile).

kilovolt. 1,000 volts. Abbreviated kv.

kilovolt-ampere. 1,000 volt-amperes. Abbreviated kva.

kilovoltmeter. A voltmeter which reads thousands of volts.

kilowatt. A unit of electrical power equal to 1000 watts.

kinescope. Name applied to a cathode-ray tube when used in a television receiver. Deflection of the electron stream is generally by magnetic means, rather than electrostatic as with cathode-ray tubes used in oscilloscopes. See cathode-ray tube. Types of kinescopes are shown below.

Kirchhoff's current law. A fundamental electrical law which states that the sum of all the currents flowing to a point in a circuit must be equal to the sum of all the currents flowing away from that point.

Kirchhoff's voltage law. A fundamental electrical law which states that the sum of all the voltage rises in a complete circuit must be equal to the sum of all the voltage drops in that same circuit.

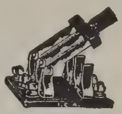
Klipsch enclosure. A folded-horn, back-loading speaker enclosure. The Klipsch enclosure is designed specifically for installation in the corner of a room and is characterized by its ability to substantially increase bass output. It employs a built-in folded horn to load the loudspeaker from the rear. This folded horn is so mounted that it extends to the walls of the room. Thus, the walls serve as an extension of the horn to augment bass response.

klystron oscillator. A microwave oscillator employing a velocity modulated tube.

knee. An abrupt change in direction between two fairly straight segments of a curve. Example: that region of a magnetization curve near saturation, or the top bend of a tube characteristic curve.

knife switch. A switch in which one or more flat metal blades, each pivoted at one end, serve as the moving parts. The blades are usually of copper; when the switch is closed, they make contact with flat, gripping spring clips and complete the circuit.

Knight-Kit. The registered trade-name of a line of electronic equipment in kit form.



Knife Switch

knob. A round, hexagonal, or pointer-shaped part secured to the end of acontrol shaft, by means of which the shaft is easily rotated.

Kovar. An alloy of iron, nickel and cobalt used extensively in the tube-making art for sealing to a hard glass. The metal matches the varying coefficient of expansion of the glass over the working range of temperatures.

kv. Kilovolt.

kva. Kilovolt-ampere.

kw. Kilowatt.

kwh. Kilowatt-hour.

L

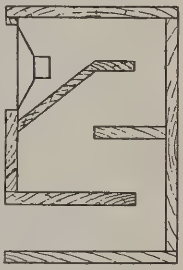
L. 1. Symbol for coil or transformer winding. 2. Symbol for inductance. 3. Abbreviation for the words length and long.

labyrinth baffle. A speaker enclosure having air chambers so designed as to prevent the presence of standing waves.

lacquer disc. A phonograph record having a surface coating of a lacquer and used both for instantaneous recordings and for commercial masters which are used to make phonograph records.

ladder network. An adjustable attenuator network of the step type in which the steps are of known attenuation, and the network presents a known and constant load to the signal source. Usually made up of T and/or Pi sections.

lag. 1. A delay in the recording or indicating of any device with respect to the conditions being measured or reproduced, e.g., theater film projection television. 2. Of two alternating electrical quantities of the same frequency, the one that reaches a particular cyclic point later is said to lag the other.



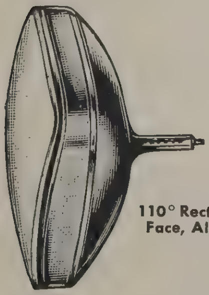
Side View of Labyrinth Baffle

lagging load. Inductive load; the current lags behind the voltage.

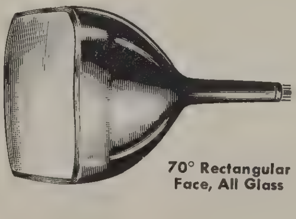
lambda. Greek letter λ, used to designate wavelength measured in meters or fractions thereof. See wavelength.

lambert. The unit of luminance. One lambert is the illuminance of a perfectly diffusing surface reflecting luminous flux at the rate of 1 lumen per sq. cm.

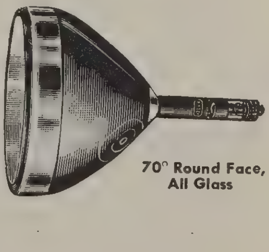
laminated. A type of construction widely used for the cores of iron core transformers, choke coils, electromagnets, motors and generators. It involves building up the de-



110° Rectangular Face, All Glass



70° Rectangular Face, All Glass



70° Round Face, All Glass

Types of Kinescopes

sired shape of core with thin strips of a magnetic material such as soft iron or silicon steel.

laminated core. An iron core for a coil, transformer, armature, etc., built up from laminations of iron or steel.

lamination. A single sheet of material used in making a laminated object, such as a transformer core.

lamp. A general term for an artificial source of light, or infrared or ultraviolet radiation.

lamp cord. General-purpose, twisted or parallel, No. 18 or 20 insulated wire. Used for speaker cord, line cord, lamps, etc. Commonly called zip cord, rip cord, or P.O.S.J. cord.

land. The record surface between two adjacent grooves.

land line. A telegraph or telephone line.

L antenna. An antenna consisting of one or more horizontal wires with vertical lead-in connected at one end.

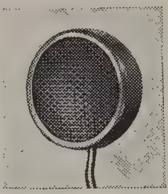
lapel microphone. A small microphone attached to a lapel or breast pocket of a coat. Used chiefly to permit free movement while speaking.

lapping. Finishing quartz crystal blanks by precision grinding. Also, the final step in production of diamond styli.

laryngaphone. A throat microphone.

latent image. Stored picture information such as that contained in the charged globule-capacitances of a television camera tube (iconoscope).

lateral recording. A phonograph record in which the needle moves from side to side during playback, while the depth is essentially constant.



Lapel Microphone
(⅓ actual size)

lateral reproducer A phonograph pickup for lateral records, including all commercial recordings.

lattice network. A network of four resistors connected in series to form a closed circuit. Two of the wires are connected in series with the input and output, one on each side of the line, while the remaining two are shunt cross-connected in the form of an "X." Circuit may also be drawn with the wires forming a square—both input and output being diagonally connected.

lattice-wound coil. A honeycomb coil. A coil wound in a manner to reduce distributed capacitance and having the appearance of lattice-work.

launching. Transferring energy from a coaxial cable or shielded, paired cable—into a wave guide.

law of electric charges. Like charges repel, unlike charges attract. See Coulomb's Law.

law of magnetism. Like poles repel, unlike poles attract. See Coulomb's law.

Lawrence tube. See Chromatron.

layer winding. A coil-winding method in which adjacent turns are laid evenly side by side along the length of the coil form.

Lazy H antenna. A type of horizontal collinear antenna array in which two or more collinear antennas are stacked one above the other. Antennas of this type have greater vertical directivity than the standard collinear antenna. See collinear array.

LC product. Inductance L in henries, multiplied by capacitance C in farads.

LC ratio. Inductance in henries, divided by capacitance in farads.

lead. (Pronounced "leed"). 1. A connecting wire, such as a test lead, battery lead, etc. 2. Of two alternating electrical quantities of the same frequency, the one that reaches a particular cyclic point first is said to lead the other.

lead-acid cell. The most common type of storage or rechargeable cell. The electrolyte is sulphuric acid and plates are spongy lead. Storage batteries consist of two or more of these cells.

lead-covered cable. (Pronounced "led"). A cable with a lead sheath.

lead-in. (Pronounced "leed-in".) The conductor or conductors that connect the antenna proper to electronic equipment.

lead-in insulator. Generally, a tubular insulator inserted in a hole drilled through an outer wall or window sash, through which the lead-in wire can be brought into a building.

lead-in spiral. A blank spiral groove at the beginning of a record, generally having a much greater pitch than that of the recorded grooves. Provided to bring the pickup quickly to the first recorded groove regardless of where it is dropped in the outer margin by a record changer.

lead screw. (Pronounced "leed"). The threaded rod that guides the cutter at a uniform rate across the surface of an ungrooved disc during recording, so that the grooves will be uniformly spaced.

leakage current. 1. Undesirable flow of current through or over the surface of an insulating material or insulator. 2. The flow of direct current through a capacitor. 3. The alternating current that passes through a rectifier without being rectified. 4. The current that flows between two or more electrodes of a tube by any path other than across the vacuous space between the electrodes.

leakage flux. Magnetic lines of force that do not encircle all the turns in a coil or transformer, and hence do not contribute to inductance or to the transfer of energy from one coil to another.

leakage inductance. A self-inductance caused by leakage flux generated in the winding of a transformer. Leakage inductance creates a condition which would be identical to the insertion of an inductance in series with the winding. It therefore causes reactance (leakage reactance) which cuts down transformer efficiency as frequency is increased.

leakage reactance. The result of leakage in a transformer. Together with distributed capacitance of the windings it may produce a resonant condition which will affect the gain of an audio frequency amplifier in the neighborhood of the resonant frequency.

leakage resistance. The resistance of the path over which leakage current flows. It is normally a high value.

leaky. A condition in which the resistance has dropped so much below its normal value that excessive leakage current flows. Usually applied to a capacitor. Also leakage between electrodes in a vacuum tube.

Lecher oscillator. A device for producing a system of standing waves in two parallel wires called Lecher wires; used in measuring frequencies above 28 mc.

Lecher wires. Two parallel wires with a movable shunt that are connected to the output of a radio-frequency source and are used mainly to measure wave-lengths shorter than about 10 meters (28 mc).

Leclanche cell. A primary cell having a carbon positive electrode and a zinc negative electrode in an electrolyte of sal ammoniac and a depolarizer. This is the common dry cell.

left-hand rule. A rule for determining direction of magnetic lines of force around a single "hot" (current-carrying) wire. If the fingers of the left hand are placed around the wire in such a way that the thumb points in the direction of *electron* flow, the fingers will then be pointed in the direction of the magnetic field. For conventional *current* flow (the opposite of electron flow), the right hand is used.

left-hand taper. Classification of a potentiometer or rheostat having the resistance concentrated near the counter-clockwise end of its rotational range.

lens. 1. In optics, a device which focuses light by refraction. 2. In electronics, a device used to focus microwaves by refraction or diffraction. Also, an electronic optical unit (such as the electron microscope) which focuses electrons. 3. In sound, an acoustic device used for concentrating sound waves by refraction.

lens disc. In the early type of mechanical television, a scanning disc having a number of holes in the form of a spiral, each with a lens.

lens turret. A revolving, lens-changing mechanism mounted on television cameras. Contains several different lenses which are rapidly interchangeable.

Lenz's law. This law states that "in all cases the induced current is in such a direction as to oppose the motion which generates it."

level. The mean amplitude of a variable quantity. Applies particularly to sound or radio waves. Expressed in decibels, VU's, volts, amperes or watts.

level indicator. A volume indicator.

Leyden jar. A capacitor having a glass jar as the dielectric material. Metal foil linings inside and outside serve as the plates.

lf, LF. Abbreviation for low-frequency; the FCC designation for the band from 30 to 300 kc.

lie detector. Technically known as psycho-integroammeter. An electronic instrument that records the functional variables of the human body such as blood pressure, heart action, skin resistance, etc., during questioning, to determine whether or not a person is telling the truth. Skin resistance usually drops when a person lies.

light. General term for radiant energy. More specifically, that region in the electromagnetic spectrum to which the human eye can respond. Roughly, 3800 to 7000 Angstrom units.

light chopper. A mechanical device for interrupting a light beam.

light modulation. Variation in the intensity of light, usually at audio frequencies, for communications or movie sound track purposes. Modulator may be a Kerr cell or glow tube.

light-negative. The property of any substance which exhibits decreased conductivity upon exposure to light.

light-positive. The property of any substance which provides increased conductivity upon exposure to light. Selenium commonly exhibits this property.

lighthouse tube. Popular designation for a transit time triode designed for use as an integral part of UHF coaxial circuits.

Lightning Arrester

lightning arrester. A protective device which prevents lightning from striking an antenna.

lightning rod. A metallic rod projecting above a structure, connected to ground.

lightning switch. A switch with large current-carrying capacity which is used to connect an antenna to ground.

light relay. A photoelectric device in which a change in light intensity closes a relay.

light-sensitive cell. A device in which light alters the voltage or conductance and thus changes the current. Also called a photo cell.

light spot scanner. Also called flying-spot scanner. A television system that uses a moving spot of light for scanning the subject being televised.

limit bridge. A form of Wheatstone bridge used for rapid routine tests of resistances. Conformity within tolerances, rather than exact resistance, is determined.

limiter. That part of an FM receiver circuit which removes amplitude variations from the FM signal by cutting off all peaks exceeding a certain amplitude.

limiting circuit. A chopping or clipping circuit which keeps one or both peaks at or below a limiting amplitude.

line. 1. A transmission line or power line. 2. In television, that portion of the picture information contained in one horizontal sweep of the electron beam.

linear. A relation such that any change in one of two related quantities is accompanied by an exactly proportional change in the other.

linear amplification. Vacuum-tube amplification over a straight portion of the characteristic curve. The wave form is reproduced accurately, but in magnified form.

linear control. A rheostat or potentiometer with uniform resistance distribution.

linear detection. Detection which depends upon rectification rather than upon curvature of the characteristics (square law detection). It may be employed with a diode, in which case complete rectification takes place. With a triode, a similar type of operation is used (plate detection). If the amplitude of the signal is sufficient to operate near cutoff (Class B) and utilizes a nearly straight portion of the transfer characteristic, the process is power detection. It is more sensitive due to the amplification of the tube.

linear distortion. Distortion independent of the amplitude of voltage or current involved.

linear modulation. Modulation which is equally proportional to the amplitude of the sound wave at all audio frequencies.

linear network. One in which the values of R, L and C do not vary with current, potential or time.

linear rectification. Rectification in which the output is directly proportional to the amplitude of the input wave

linearity control. In television sets, an adjustment in the vertical or horizontal sweep oscillator which controls the linearity of the sawtooth waveform and consequently the uniform distribution of the picture elements of the image. When the sawtooth is not linear, the spot sweeps across the screen at a varying instead of a constant rate, with the end result being a picture spread out near one edge and crowded toward the opposite edge.

line-balance converter. A device isolating the outer conductor of a coaxial line from ground.

line cord. A two-wire cord terminating in a two-prong plug at one end and used to connect electronic equipment or appliances to a power outlet.

line-cord resistor. An asbestos-enclosed wire-wound resistance element incorporated in a line cord for use with radio sets to reduce the voltage to that required by series-connected tubes.

line drop. The voltage drop between two points on a power line or transmission line, due to the resistance, reactance or leakage of the line.

line equalizer. Inductance and/or capacitance inserted in a transmission line to correct the frequency response characteristic of the line.

line filter. A device inserted between the line cord plug of a radio receiver and the power line to block noise impulses which otherwise enter the receiver from the power line. It contains one or more choke coils and capacitors.

line flyback. In a television system, the right-to-left return sweep from the end of one scanning line to the beginning of the next. Also called horizontal flyback or retrace.

line impedance. Impedance as measured across the terminals of a transmission line. Frequently, the characteristic impedance of the line.

line interlacing. In television, the standard system of picture scanning in which odd-numbered lines are scanned as the first field, and even-numbered lines are scanned as the second field.

line microphone. A highly-directional microphone made up of small tubes of different lengths with a microphone at their one even end, the open ends being uneven. Popularly known as a machine-gun mike.

line noise. Disturbing electrical impulses originating in a transmission line.

line-of-sight distance. Straight-line distance from station to horizon. Represents transmitting range, under normal conditions, of high frequency stations such as television, FM, radar, etc. Radiation exhibits optical properties.

line-synchronizing impulse. In television, the impulse added to the video signal at the end of each scanning line for receiver synchronizing purposes.

line voltage. The voltage existing at a wall outlet or other terminals of a power line system. In the United States, the line voltage is usually between 115 and 120 volts, with 117 as an average, but may vary at times as much as five volts above or below the 115 and 120 volt limits.

line-voltage regulator. A device such as a ballast voltage regulator tube or special transformer that delivers an essentially constant voltage to the load, regardless of minor variations in the input voltage.

link. 1. The fusible and replaceable part used in some types of cartridge fuses. 2. A closed circuit containing one or more coils. Used to couple radio frequency circuits. 3. A flat strip serving as a removable connector between two terminal screws.

link circuit. See definition no. 2 under link.

link coupling. Two or more coils of separate circuits coupled by a link. See no. 2 under link.

Line Voltage Regulator

link neutralization. A method of balancing out the feedback caused by plate-grid capacitance in an RF amplifier tube in order to prevent self-oscillation. In link neutralization a pickup coil (link) in the output circuit is connected to a pickup coil in the input circuit. The polarity of the pickup coils should be such that they introduce feedback which is out of phase with the feedback voltage caused by the plate-grid capacitance.

lip microphone. A type of carbon microphone worn on the upper lip and used where outside noise level is extremely high. Unidirectional characteristic reduces unwanted noise pickup.

Lissajous figures. A family of plane curves described by a point having two simple harmonic motions at right angles, various phase relations and integral frequency ratios. Widely used for frequency comparison by means of cathode-ray oscilloscopes.

litz wire. Wire made up from a number of fine, separately-insulated strands specially braided or woven together for reduced skin effect and hence lower resistance to high frequency currents. The full name is litzendraht wire.

live room. A room that has a minimum of such sound-absorbing materials as rugs, drapes, upholstered furniture, etc. A room of this type has sound-reflecting surfaces and subsequently, longer reverberation time.

L network. A network composed of two impedance branches, one connected across the load and the other in series with one side of the load, and together resembling, in the schematic diagram, the figure L.

load. 1. The power that a device delivers. 2. A device placed in a circuit to absorb power or convert it. That which is operated.

loaded antenna. An antenna with extra inductance or capacitance in series to change its electrical length.

loading coil. A coil connected in series with an antenna to increase its electrical length.

load line. A straight line drawn across a series of plate current-plate voltage characteristic curves on a graph to show how plate current will change with grid voltage when a specified plate load resistance is used. Load lines of similar nature can be drawn for photo tubes.

lobe. One of the loops in the radiation pattern of an antenna.

lobe switching. Radiating a radio frequency beam rapidly back and forth between two fixed positions. Useful for accurate direction finding in radar.

local action. Electrolysis occurring between nearby points of a cell electrode due to the presence of impurities. In dry cells the effect is overcome by amalgamation. Similar action on metal surfaces results in corrosion.

local oscillator. The oscillator of a superheterodyne receiver. Any oscillator incorporated into an electronic system.

locked groove. A blank endless groove placed inside the record grooves of a phonograph record to prevent further travel of the needle after it reaches the end of the record, or to trip the record changer mechanism.

locking relay. A relay which locks into position when its coil is energized momentarily, thus eliminating the need of continual coil energization. Sometimes has a manual release or reset lever, or a second coil which releases relay upon energization. Also called a latching relay.

loctal tube. An 8-prong vacuum tube having a lock-in type base. Used in auto radios or wherever mechanical vibration is appreciable. The tube pins are sealed directly into the glass envelope. Also spelled loktal.

lodestone. A mineral consisting chiefly of a magnetic oxide of iron that is found in its natural state in a magnetized condition. Also called magnetite.

log. 1. Abbreviation for logarithm. 2. A list of radio stations showing frequencies, location, power and other data. 3. A communications record of a station, showing frequency, call of other station, etc. 4. Detailed record of programs broadcast by an AM, FM or television broadcast station. 5. A record of meter readings in commercial stations.

logarithm. The logarithm of a number is the power to which a second number, called the base, must be raised in order to yield the original number. Bases in common use are 10 and 2.718 (ϵ).

logarithmic curve. A curve in which one coordinate of any point on it varies in accordance with the logarithm of a quantity.

logarithmic decrement. Term describing the rate of decrease of a damped oscillation.

logarithmic horn. A horn whose diameter varies with length according to a logarithmic law.

logarithmic scale. A linear scale for graphs, on which distances from zero of the scale are proportional to the logarithms of the numbers with which these points on the scale are labeled.

loktal tube. See loctal.

longitudinal waves. Waves such as sound, pressure and some seismic waves which are transmitted through a material medium and have the further property that the individual particles involved in the wave motion move back and forth in the direction in which the wave progresses. The medium undergoes condensations and rarefactions. Radio waves are not longitudinal, but are transverse.

long-play. In common usage, "LP." A 10- or 12-inch phonograph record that operates at a speed of 33⅓ rpm. The sound-carrying grooves are very finely cut, and commonly referred to as "microgroove."

long waves. Wavelengths longer than the longest broadcast band wavelength of 545 meters. Long waves correspond to frequencies between about 20 kc and 550 kc.

long-wire antenna. An antenna whose length is an integral multiple of a half-wavelength. Also called a harmonic antenna.

loop. 1. A closed circuit. 2. A graph having the form of a closed curve, such as a hysteresis loop. 3. An antinode (a point of maximum amplitude in a standing wave).

loop antenna. An antenna consisting of one or more complete turns of wire. It may be built into a radio receiver cabinet or separately mounted, and is usually tuned to resonance by a variable capacitor. Loop antennas are also commonly used in direction-finding equipment.

loop equation. An equation expressing the voltages around a closed path, mesh, or loop in a circuit. Such equations are based on Kirchhoff's voltage law and are used in the solution of circuit problems.

loopstick antenna. A relatively new type of built-in receiving antenna widely used in broadcast receivers. Loopstick antennas consist of a coil wound on an iron core and approximately 2 feet of pickup wire. In some types the inductance is adjusted by sliding the coil along the core; other types have a movable core for adjustment of inductance. Loopsticks are installed in the antenna circuit as are loop antennas. They are sometimes preferred to loop antennas, since they provide excellent signal pickup, are non-directional, and occupy minimum space.

loose coupling. A small amount of coupling between two coils or circuits.

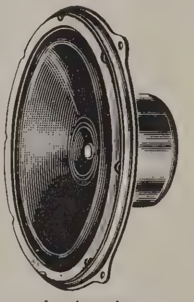
loran. (Long Range Navigation). A system used by ships and aircraft for fixing their own position from radio signals broadcast by two or more synchronized transmitting stations at pre-determined locations.

loss. Energy dissipated without accomplishing useful work.

loudness control. A loudness control is a combination volume control and tone compensator which boosts the bass and treble frequencies when volume is turned down. This compensates for the reduced response of the ear to bass and treble at low volume levels. Thus, the listener can enjoy full-range audio regardless of the volume setting. The reduced response of the ear to bass and treble at low volume levels is shown in the Fletcher-Munson curves.

loudness level. The intensity level in decibels of a pure 1,000 cycle tone that seems equivalent in loudness to the sound under consideration. Also called equivalent loudness level.

loudspeaker. A device for converting audio frequency current into sound waves.



Loudspeaker

louver. A type of loudspeaker grille construction in which slats or equivalent parts of a cabinet hide the loudspeaker yet allow sound waves to emerge unhindered. Also spelled louvre. Also, a set of slot-like openings in a cabinet for ventilation and cooling.

low band. Television channels 2-6, 54-88 mcs.

low-definition television. Television involving less than about 200 scanning lines in the picture.

low-frequency. A frequency in the band extending from 30 to 300 kilocycles in the radio spectrum.

low-frequency padder. The trimmer capacitor of a superheterodyne receiver connected in series with the oscillator tuning circuit to obtain correct calibration at the low-frequency end of the tuning range.

low-level modulation. Modulation introduced in the early stages of amplification.

low-loss construction. A type of radio part construction involving the use of insulating materials which maintain their characteristics at high radio frequencies.

low-loss insulator. One having high RF resistance, and therefore very negligible loss at these frequencies.

low-pass filter. A filter designed to pass currents at all frequencies below a critical frequency, while substantially attenuating the amplitude of other frequencies.

L pad. A dual volume control which presents a constant load impedance at all control settings.

LP. Abbreviation for long play. Most often used in reference to the 33⅓-rpm stereophonic or monophonic microgroove phonograph record.

lug. A small strip of metal placed on a terminal-screw or riveted to an insulating material to provide a convenient means for making a soldered wire connection.

lumen. The unit of luminous flux. One lumen is the visible radiation power on a surface one foot square located one foot from a point source of one candle-power.

luminance. Amount of radiant energy emitted from a source and evaluated in relation to its ability to evoke brightness; in color TV, luminance is determined by the amount of beam current striking the phosphor screen and the accelerating voltage of the electron guns.

luminance channel. In present-day color TV receivers, the path which is intended to carry the luminance or black-and-white portion of the color picture signal.

luminescent. Any material that will give off light when excited by a beam of electrons or a source of radiant energy.

luminous intensity. The candlepower or strength of a source of light.

lumped impedance. Impedance concentrated in a component, as distinguished from stray or distributed effects.

lumped inductance. Inductance concentrated in a component, as distinguished from stray or distributed inductance.

Luxemburg effect. Interaction in the upper atmosphere between the modulated waves of a strong AM station and the weaker signal of another station on a different frequency. As a result, the program of the stronger station is audible during reception of the weaker station. So named because the first known case involved Radio Luxemburg. A rare occurrence.

M

M. 1. Roman numeral meaning 1000. 2. In radio and electronics usage, M is often one million (10^6), particularly with respect to values of resistors and potentiometers. 3. Symbol for mutual inductance.

ma. Abbreviation for milliampere.

magic eye. A cathode-ray tuning indicator tube.

magnal base. An 11-pin base used for cathode-ray tubes.

magnesium-copper sulphide rectifier. A dry-disc rectifier consisting of magnesium in contact with copper sulphide. See dry-disc rectifier.

mganet. A body which attracts iron and steel, and if free to move, sets itself in a definite direction due to the influence of the earth's magnetic field.

magnetic amplifier. A tubeless, sensitive amplifier, in which large output current changes can be controlled by the introduction of small voltage changes across a control field. This is accomplished by a phase change produced between the magnetic fields set up by the field and amplifier windings. Magnetic amplifiers are characterized by their excellent linearity and extremely high amplification. Extremely useful applications in servo mechanisms, and as "memory" devices in computers.

magnetic cartridge. A device used in phonographs to convert recorded sound material to electrical energy. The cartridge mounts at the end of a phonograph pickup arm and includes a stylus (needle) which rides in the grooves of a record disc. Thus, as the record revolves, the stylus vibrates in a pattern coinciding with the pattern of the sound material represented by the record grooves. In one type of magnetic cartridge (moving coil type) the stylus causes a coil to vibrate between the poles of a magnet so that current is induced in the coil. In another type of magnetic cartridge (variable reluctance type) a portion of the stylus assembly vibrates in the magnetic field between two coils so that current is induced in the coils. The current induced in the coil of the moving coil cartridge or the two coils in the variable reluctance cartridge coincides with the sound material on the record. The output voltage taken from the coil or coils in the cartridge is conducted to an amplifier for amplification and transformation to audible sound. Modern magnetic cartridges are characterized by very wide frequency response and low distortion. However, they deliver only a fraction of the output voltage of crystal cartridges and, therefore, they require an extra stage of amplification (preamplification). The magnetic cartridge is a constant-velocity device, *i.e.*, the greater the frequency (hence, velocity) of stylus movement, the greater is the output.

magnetic circuit. A closed path of magnetic flux. See Ohm's law for magnetic circuits.

magnetic component. The electromagnetic component of a radio wave.

magnetic cycle. One complete cycle of changes in the magnetization of an object, corresponding to one cycle of the alternating current producing the magnetization. A hysteresis loop represents one complete magnetic cycle.

magnetic damping. Controlling mechanical motion by the reaction between two or more magnetic fields.

magnetic deflection. Method of bending electrons in a cathode-ray tube by means of the magnetic field produced by coils placed outside the tube.

magnetic field. A region in space surrounding a magnet or a conductor through which current is flowing.

magnetic field intensity. Magnetizing force or magnetic force.

magnetic figures. A pattern showing the distribution of a magnetic field, made by sprinkling iron filings on a nonmagnetic surface in the field.

magnetic flux. The sum of all the magnetic tubes of force from a magnetic source.

magnetic flux density. The number of magnetic tubes of force per unit area.

magnetic focusing. A method of focusing an electron stream in a cathode-ray tube through the action of an electromagnetic lens. Electrons along the tube axis are undeflected. Those with radial velocity components are given a spiral motion which brings them to the axis at the focus.

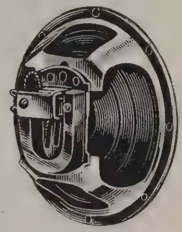
magnetic hysteresis. Internal friction occurring in a ferromagnetic substance such as iron or steel when subjected to a varying magnetic field. It constitutes a loss.

magnetic hysteresis loss. The energy converted into heat as a result of magnetic hysteresis.

magnetic leakage. Passage of magnetic flux outside of the path along which it can do useful work.

magnetic lines of force. Imaginary lines used for convenience to designate the directions in which magnetic forces are acting throughout the magnetic field associated with a permanent magnet, electromagnet or current-carrying conductor.

magnetic loudspeaker. An early type of loudspeaker. It consisted of a horseshoe magnet and an armature within the magnetic field. Action of the armature was transmitted through a driving pin to a cone which converted the electrical energy into sound waves.


Magnetic Loudspeaker

magnetic pick-up. A phonograph pick-up consisting of a permanent magnet, one or two coils, an iron armature and a core structure so arranged that movement of the phonograph needle in the record groove varies the amount of magnetic flux passing through the coils, thereby inducing audio frequency voltages in the coils. Also see *magnetic cartridge.*

magnetic poles. Regions in a magnet near which the field is concentrated. Usually the two ends of a magnet; one a north pole, one a south pole. The north and south pole strengths are equal.

magnetic pole strength. Force exerted on a metallic object by a magnetic pole; measured in unit poles. A unit pole is one which repels a similar pole at a distance of one centimeter with a force of one dyne.

magnetic relay. A highly sensitive moving-coil relay that must be reset manually or by a separate electric solenoid.

magnetic recording. Recording audio frequencies by magnetizing areas of tape or wire. When the magnetized tape or wire is passed through a reproducing head for playback, the magnetized areas are reconverted into electrical energy, then changed back to sound, through the medium of headphones or loudspeaker; the recorded material may also be converted to visual sound by the use of an oscilloscope, other visual indicator or graph recorder. Also used with tape recorders for the magnetic recording of the video material for TV programs.

magnetics. The branch of science which deals with the laws of magnetic phenomena.

magnetic sensitivity. In TV, the relationship between the current flowing through the deflection coils and the physical distance by which the electron stream is displaced.

magnetic saturation. That condition in an iron core in which further increases in magnetizing force produce little or no increase in magnetic flux density.

magnetic shield. A soft iron housing used around delicate instruments or radio parts to protect them from the effects of stray magnetic fields.

magnetite. An oxide of iron, strongly attracted by a magnet. Magnetite is sometimes polarized, being then called lodestone.

magnet keeper. A bar of soft iron placed across the poles of a permanent horseshoe magnet to complete the magnetic circuit when the magnet is not in use, to avoid demagnetizing.

magnetomotive force. Magnetic potential difference. Expressed in gilberts, i.e., ergs per magnet pole. Another unit is the ampere-turn, in which the magnetomotive force is the number of amperes of current in a coil multiplied by the number of turns. Magnetomotive force in gilberts is $0.4\pi NI$.

magnetostriction. Slight variations in length of an iron or steel rod due to an alternating magnetic field in the direction of the axis of the rod. Used as a source of ultrasonic oscillations.

magnetostriction oscillator. A highly stable oscillator in which grid and plate coils are wound on the two halves of an iron rod. Plate current causes a deformation in the length of the rod. This displacement produces grid voltage which further excites the plate oscillation.

magnetron. A vacuum diode having axial symmetry. Electrons from the central cathode are deflected in their output path by an axial magnetic field. They may be prevented from arriving at the anode by a critical field. Such a tube may be used as a detector of ambient magnetic fields. Microwave magnetrons are of the split or multiple anode variety. Circulating electrons form space charge clouds which deliver energy in pulses as they pass the gaps between anodes. The gaps are coupled to cavities.

magnetron effect. The reduction of electron emission in thermionic vacuum tubes as a result of the magnetic field of the filament current.

magnetron rectifier. A tube rectifier in which the electron stream is controlled by an external magnetic field.

magnet wire. Insulated copper wire in sizes commonly used for winding coils used in electromagnetic devices such as transformers, choke coils and relays.

Magnet Wire

male connector. See connector.

man-made static. Interference caused in radio-television receivers by motors and other electrical devices in which sparking takes place.

manometer. A pressure-measuring gauge.

manual control. An arrangement involving opening or closing of switching devices by hand.

manual tuning. Tuning a radio receiver to a desired station by rotating the tuning control knob by hand.

Marconi antenna. An antenna with its connection made to ground through a suitable tuning coil.

marker beacon. Radio transmitters located between radio-range stations of airways, enabling pilots to determine their locations.

marker generator. A radio-frequency generator used for television and FM alignment and laboratory applications. A marker generator is normally used in conjunction with an oscilloscope and sweep generator. The marker generator injects a pip or pips on the pattern produced by the sweep generator. These pips serve as guides to permit accurate adjustment of the response curve of tuned circuits.

marking wave. In telegraphic communication, that portion of the emission during which the active portions of the code character are being transmitted. Called keying wave.

masonite. Fiberboard that consists of wood fibers exploded in the presence of steam. Sometimes used for panels in electrical equipment.

mass. The weight of a body divided by its acceleration due to gravity. Mass is an important factor in the design of phonograph pickup arms, cartridges and styli. It should be kept at a low value in order to minimize record wear and achieve best tracking.

mast. A vertical metal pole serving as an antenna support or as the antenna proper.

master. The negative phonograph record produced directly from the original recording as one step in the manufacture of commercial records.

master brightness control. In color TV, a variable resistor which adjusts the bias on all guns of a three-gun picture tube at the same time.

master control. A control board at which all of the main operating controls of a radio-television broadcast studio are located. This is the point from which sound or television programs are switched to one or more transmitters.

master oscillator. An oscillator of comparatively low power, so connected as to establish the carrier frequency of the output of an amplifier or transmitter.

master oscillator-power amplifier. An electronic combination of a vacuum-tube oscillator followed by a radio-frequency amplifier stage. Abbreviated M.O.P.A.

matched impedance. The coupling of two circuits in such a way that the coupling device matches the impedance of both circuits.

matching. Connecting two circuits or parts together with a coupling device in such a way that the impedance of either circuit will be equal to the impedance existing between the coupling terminals to which the circuit is connected.

matching impedance. The impedance value that must be connected to the terminals of a signal-voltage source for proper matching.

matching stub. A conducting loop connected between the wires of a transmission line or a parallel-rod tank circuit placed at a particular position for matching purposes.

matching transformer. A transformer for matching two or more impedances. See impedance-matching transformer.

matrix. 1. The negative from which duplicate phonograph records are molded. 2. In a color television receiver, the stage in which the three primary color signals (red, blue and green) are recovered for the picture tube.

Matteucci effect. Voltage generating property of a twisted ferro-magnetic wire upon change of its magnetization.

maximum undistorted output. The maximum audio power output which a radio receiver or audio amplifier will deliver without having more than 5% total harmonic distortion. Tests have shown that this amount of distortion is not ordinarily noticeable or objectionable.

maximum usable frequency. The highest frequency that can be used for radio transmission between two points on the earth by reflection from the regular ionized layers of the ionosphere at a specified time.

maxwell. The CGS electromagnetic unit of magnetic flux. It is equal to one gauss per square cm., or to one magnetic line of force.

Maxwell bridge. An AC bridge having parallel R and C in one arm: series R and L in the opposite arm.

Mayday. The international distress call for radiotelephone communication. It is derived from the French pronunciation of "M'aidez," meaning "Help me."

mc, MC. Abbreviation for megacycle (s).

mcw. Abbreviation for modulated continuous waves.

m-derived sections. T or Pi filter sections so designed that when joined in a filter unit their impedances are matched at all frequencies, yet they may have different resonant frequencies.

mean carrier frequency. The resting frequency of a frequency-modulation transmission system.

mechanical bandspread. Use of a vernier tuning dial or other mechanical means to simplify tuning in crowded short-wave bands.

mechanical rectifier. A vibrator.

mechanical scanning. An obsolete mechanical system of breaking up a scene into a rapid succession of narrow lines as required for conversion into electrical impulses in a television system. Scanning of the scene is accomplished by mechanical means such as rotating scanning disks (the early Nipkow disc), rotating mirrors, etc. A newer, more satisfactory method of electronic scanning is used in modern television practice.

mechanical television system. A television system in which moving mechanical devices are employed at both the transmitter and receiver for scanning purposes.

medium frequency. The band from 300 to 3,000 kc.

meg. Sometimes used as abbreviation for megohm.

meg- or mega-. A prefix meaning one million times.

megabar. An absolute unit of pressure equal to one million bars. One megabar is almost exactly equal to normal atmospheric pressure.

megacycle. One million cycles per second.

megatron. See lighthouse tube.

Megger. A high-range ohmmeter having a built-in hand-driven generator as a direct-voltage source, used for measuring insulation resistance values.

megohm. One million ohms. Abbreviated meg (s).

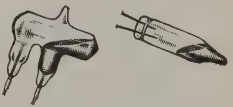
Meissner oscillator. A radio-frequency oscillator circuit in which coils in the grid and plate circuits are coupled to a coil in a separate resonant circuit that is tuned to the desired frequency.

mercury. A heavy, silvery-colored metal which is liquid at ordinary room temperatures. When heated, it gives off a vapor which is highly conductive when ionized.

mercury barometer. An instrument for measuring the pressure of the atmosphere. Normal atmospheric pressure is approximately 76 centimeters of mercury.

mercury battery. A type of battery especially characterized by extremely uniform output voltage throughout its life. While the output voltage of most batteries tends to gradually taper during their life, a mercury battery delivers practically constant output voltage until it reaches almost the very end of its life. Also characterized by very long shelf life and high resistance to chemicals, heat and humidity. Mercury batteries employ a zinc powder anode; the cathode is mercuric oxide powder and graphite powder.

mercury switch. An electric switch made by placing a large globule of mercury in a glass tube having electrodes arranged in such a way that tilting the tube will cause the mercury to make or break the circuit.



Mercury Switches

mercury-vapor rectifier. A single or polyphase diode rectifier tube containing mercury vapor. The gaseous discharge makes possible much larger anode currents than could be obtained in a vacuum tube of equivalent dimensions.

mesh. A single closed circuit loop or cell in a network; a series of branches that form a complete loop.

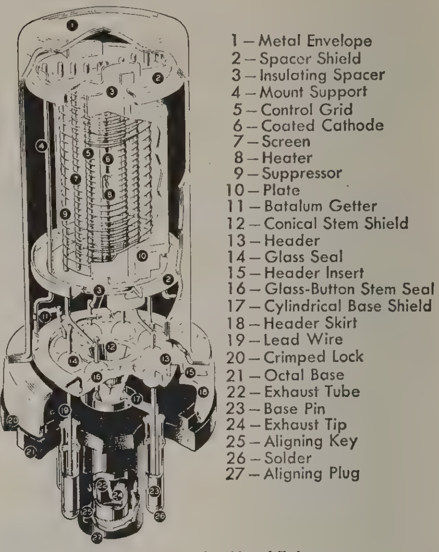
mesh equations. Equations for the Kirchhoff-law solution of circuit problems, which are set up in terms of mesh impedances and currents.

meson. A particle that is formed as a result of collision between cosmic rays and gas molecules. One type has a mass about 200 times that of an electron.

metal detector. An electronic device for detecting concealed metal objects by variations in inductance.

metallic insulator. A shorted quarter wave section of a microwave transmission line which acts as an electrical insulator at the frequency for which its length is one quarter wavelength.

metallized resistor. A fixed resistor, in which the resistance element is a thin film of metal deposited on the surface of a glass or ceramic tube.



Structure of a Metal Tube

Courtesy RCA Tube Dept.

metal tube. A vacuum or gaseous tube having a metal envelope, with electrode leads passing through glass beads fused into the metal housing. Illustrated above.

meter. 1. A device that measures and registers the integral of an electric quantity. Example: a watt-hour meter. 2. Any type of electric measuring instrument such as a voltmeter, ammeter, wattmeter, ohmmeter. 3. The basic unit of length in the metric system, equal to 39.37 inches.

metrechon. A storage tube used for scanning-converter applications, *e.g.*, radar and industrial television.

metric system. A decimal system of weights and measures used extensively by scientists, and used for ordinary purposes in many countries outside of the United States and Great Britain. All units are in multiples of ten.

m-f, mf. Abbreviations for medium frequency.

mfd. Abbreviation for microfarad. Also written mf, uf, or μf.

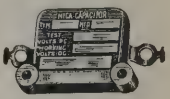
mh. Abbreviation for millihenry.

mho. The unit of conductance or admittance. It is the word ohm spelled backwards.

mica. A transparent flaky mineral which splits readily into thin sheets and has excellent insulating and heat-resisting qualities. It is used extensively to separate the plates of capacitors, to insulate electrode elements of vacuum tubes, and for many other insulating purposes in radio.

mica capacitor. A type of fixed capacitor employing mica as the dielectric material.

micro-. A prefix meaning one-millionth of. Designated by the Greek letter μ (mu) in abbreviation.



Mica Capacitor

microammeter. A meter reading in microamperes.

microampere. One-millionth of an ampere. Also written μa.

microfarad. One-millionth of a farad. Abbreviated as mfd; also as uf, μf, and mf.

microgroove. A very small groove which permits greater recording time on phonograph records. Records with microgrooves, monophonic or stereo, accommodate needles with .001″ or .0007″ radius respectively; while standard records take a .003″ needle.

microhenry. One-millionth of a henry. Also written μh.

microhm. One-millionth of an ohm.

micromho. One-millionth of a mho.

micromicro-. A prefix meaning one-millionth of one-millionth of. Designated by the Greek letter μ (mu) used twice, as in μμf (micromicrofarad).

micromicrofarad. One-millionth of a microfarad. Abbreviated μμf, uuf, mmf and mmfd.

micron. A unit of length equal to one-millionth of a meter or one-thousandth of a millimeter.

microphone. A device which converts sound waves into corresponding audio frequency electrical energy. It contains some form of flexible diaphragm which moves in accordance with sound wave variations. This movement, in turn, generates a minute voltage which is fed to the input of an amplifier where it is amplified many times. There are several types of microphones available, but they all operate on the above principle. **Carbon Microphone.** A microphone in which loosely packed carbon granules complete the electrical circuit between two terminals. The resistance of this circuit varies in accordance with variations in the pressure exerted on the granules by the sound-actuated diaphragm. In a single-button carbon microphone, the granules are on only one side of the diaphragm. In a double-button carbon microphone the granules are on both sides of the diaphragm, giving a push-pull action which greatly increases the resistance change produced by a given diaphragm movement. **Condenser Microphone.** A microphone in which the diaphragm serves as one plate of a capacitor. Sound waves move the diaphragm in and out, causing the capacity of the microphone and the current through it to vary in accordance with the sound waves. **Contact Microphone.** A microphone designed to pick up mechanical vibrations directly and convert them into electrical impulses. It is used chiefly with string, wind, and percussion musical instruments, and is simply strapped or clamped to the housing of the instrument. **Crystal Microphone.** A microphone depending upon the piezoelectric effect of Rochelle salt crystals to transform the mechanical stress produced by sound waves into electrical output. **Dynamic Microphone.** A microphone in which the diaphragm moves a voice coil back and forth in a constant magnetic field, causing audio currents to be induced in the coil. A small dynamic loudspeaker is often made to serve also as a dynamic microphone, particularly in two-way intercommunication systems. **Velocity or Ribbon Microphone.** A microphone in which a thin light-weight ribbon or duralumin alloy serves as the diaphragm. This ribbon is mounted in a powerful fixed magnetic field. Audio frequency voltages are induced in the ribbon when it is moved back and forth through the magnetic field by sound waves.

microphone amplifier. An audio amplifier used to raise the output level of a microphone to a voltage adequate to drive a conventional audio amplifier. See preamplifier.

microphone boom. An extension "arm" used to support a microphone within range of the sound to be picked up. Used extensively in motion pictures and television productions when it is desirable to keep the microphone from the viewers' range of vision.

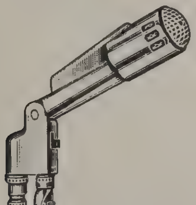
microphone button. A button-shaped container filled with carbon particles and serving as the resistance element of a carbon microphone.

microphone cable. A special shielded cable used to connect a microphone to a microphone amplifier.

microphone cartridge. The element of the microphone that contains the device to change sound waves into electrical energy. In crystal microphones this element contains a Rochelle salts crystal to which the diaphragm is connected. Sound waves striking the diaphragm cause a flexing of the crystal, producing a voltage by piezo-electric-effect. Cartridges for reluctance-type dynamic microphones contain a moving coil or armature to which the diaphragm is connected. Sound waves striking the diaphragm cause movement of the coil or armature in a magnetic field thus developing a voltage that varies with the sound waves.

microphone mixer. A device used to feed two or more microphones into a single microphone input on an audio amplifier. Separate controls on the mixer permit adjusting the output level of each microphone.

microphone pre-amplifier. An audio amplifier which amplifies the output of a microphone sufficiently so that the audio signal may be sent over a transmission line to the main amplifier. Sometimes, particularly with condenser microphones, this microphone amplifier is mounted right on the microphone stand or in the microphone housing itself.



Dynamic Microphone

microphone transformer. An iron-core transformer used for coupling microphones to the audio amplifier input.

microphonic. A condition in which mechanical movement of some radio part other than a microphone causes corresponding variations in circuit current. A radio tube is microphonic if a pinging sound is heard in the loudspeaker when the side of the tube is tapped with a finger; the tapping is then setting the internal elements into vibration. If sound waves from the loudspeaker are producing this vibration of tube elements, the sound will be sustained as a howl.

microray oscillator tube. A triode tube used for generating extremely high frequencies.

microswitch. Trade name for a small unit in which a minute motion makes or breaks contact. Actuated mechanism is a bent diaphragm which snaps from one position to a second one rapidly and positively.

microvolt. One-millionth of a volt.

microvoltmeter. A highly sensitive voltmeter that measures differences of potential in microvolts.

microvolts per meter. A measure of the intensity of the signal produced by a radio transmitter at a given point. Stronger signals are expressed as millivolts per meter.

microwave oscillator. An oscillator that generates frequencies higher than 300 megacycles.

microwave relay system. A system of transmitting information on ultra-high radio frequencies via a series of relay towers erected at 10 to 25 mile intervals between the point of origin and the destination. The system utilizes the characteristic straight-line radiation pattern of microwaves to beam signals from tower to tower. Each tower has a receiver which picks up the signal from the preceding tower, and a transmitter which re-broadcasts the signal on to the next tower. The microwave relay system is used extensively in television, by large cities on the coast-to-coast coaxial cable, to re-broadcast program material to the TV stations in surrounding small cities. The system is also being used for telephone and telegraph communications, as well as for private industrial applications. A typical industrial use is that employed by large oil companies in using the system to meter miles and miles of pipeline at specific locations to determine rate of flow, pressure, etc. Frequencies used in microwave systems range from 3000 to 30,000 mc.

microwaves. Electromagnetic waves whose frequencies are higher than 300 mc.

midband frequency. That audio amplifier frequency which is equal to the square root of the product of the two half-power frequencies.

mil. A unit of length equal to one-thousandth of an inch used in specifying diameters of round conductors.

milli-. A prefix meaning one-thousandth of.

milliammeter. A meter calibrated in milliamperes.

milliampere. A unit of current equal to one-thousandth of an ampere. Abbreviation ma.

millihenry. A unit of inductance equal to one-thousandth of a henry. The plural is millihenries. Abbreviated mh.

millimeter. A metric unit of length equal to one-thousandth of a meter, or approximately 1/25th inch (0.03937 inch). Abbreviated mm.

millimicron. A unit of length equal to one-thousandth of a micron, and hence equal to one-millionth of a millimeter.

milliohm. One thousandth of an ohm.

millivolt. A unit of voltage equal to one-thousandth of a volt. Abbreviated mv.

millivoltmeter. A voltmeter that measures in millivolts.

millivolts per meter. See microvolts per meter.

milliwatt. A unit of power equal to one-thousandth of a watt.

miniature tubes. A type of small electron tube. Miniature tubes are either the 7-pin or noval (9-pin) type. These tubes have no bases, the extended elements are the pins.

minimum resolving distance. The distance a viewer may move away from the image on a television screen and still be able to distinguish the horizontal lines of the picture.

minus sign (−). The minus sign is used to indicate subtraction or a negative value. Serves to indicate negative polarity or the negative terminal of a device.

mirror galvanometer. A suspended coil instrument which, instead of using a needle or finger to indicate the reading, employs an optical lever system. See optical lever.

mismatch. The condition in which the impedance of a source does not match or equal the impedance of the connected load. This reduces power transfer by causing reflection.

misregistration. The presence of wrong color or colors in a color picture tube due to some faults in the tube, in components directly associated with the tube, or in some of the adjustments.

mixed-high frequencies. The portion of the television color signal which carries the finer details (higher frequencies) of the transmitted image.

mixer. 1. A device ordinarily consisting of one or more potentiometers for combining the audio-frequency output signals of two or more microphones or other audio-frequency signal sources in any desired proportion at the input of a main audio-frequency amplifier. 2. That stage in a superheterodyne receiver in which the incoming modulated radio-frequency signal is combined with the signal from the local oscillator to produce the intermediate-frequency signal.

mixer-first detector stage. Same as 2 under mixer. Also called mixer stage and first detector.

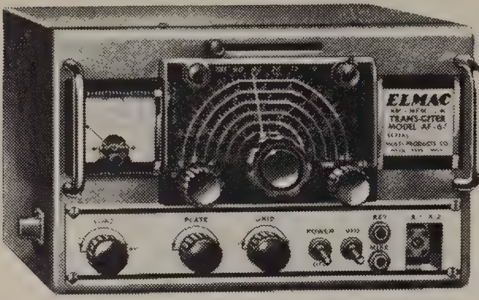
mixer tube. The vacuum tube in the mixer stage.

mixing. Combining two or more signals.

M.K.S. See C.G.S.

mmf. Abbreviation for micromicrofarad. Also written mmfd, uuf, and $\mu\mu f$.

mobile receiver. A radio receiver designed to be operated while in motion, as on an automobile or carried by troops.



Mobile Transmitter

mobile transmitter. A radio transmitter designed to be operated while in motion.

mode. A microwave term specifying the type of oscillation occurring in a line, waveguide, cavity or tube. Moding, which is a transition from one mode to another, is a frequent trouble encountered in the process of tuning microwave generators.

modulate. To vary the amplitude, frequency, or phase of an oscillation, usuallyat a signal frequency rate.

modulated amplifier. That stage in a radio transmitter at which the intelligence signal is introduced into a tube or tubes carrying the radio-frequency carrier signal.

modulated light. Light that has been made to vary in intensity in accordance with variations in an audio-frequency or code signal (as in facsimile transmission).

modulated stage. The radio-frequency stage to which the modulator is coupled.

modulated wave. A carrier wave whose amplitude, frequency or phase is varied with an intelligence signal.

modulating wave. The audio-frequency or other intelligence signal wave used to vary the amplitude or other characteristic of a carrier wave in the process of modulation.

modulation. The process in which the amplitude, frequency, or phase of a carrier wave is varied with time in accordance with the wave form of an intelligence signal. Velocity modulation is the bunching of electrons in a beam.

modulation distortion. Distortion occurring in the radio-frequency amplifier tube of a receiver, resulting in sounds that were not in the original program.

modulation envelope. A curve drawn through the peaks of a graph showing the waveform of an amplitude-modulated signal.

modulation factor. Modulation index. Usually refers to FM. For an amplitude-modulated wave, the ratio of half the difference between the maximum and minimum amplitudes to the average amplitude. The maximum value without overmodulation is 1. This ratio is multiplied by 100 to get percentage modulation.

modulation index. Modulation factor.

modulation monitor. An instrument used to provide a continuous indication of the modulation percentage at a transmitter.

modulation percentage. The modulation factor multiplied by 100 for expressing as a percentage.

modulator. In a transmitter, the final audio-frequency stage feeding an audio-frequency signal into the modulated amplifier stage for combining there with the radio-frequency carrier signal.

module. A complete circuit, often in plug-in form, which is designed for insertion into a larger circuit. Modules are very compact and include all necessary circuit components, such as coils, resistors and capacitors. Module techniques are highly adaptable to automation. Circuits using modules are called modular circuits.

Module

moire. In television, a spurious, watery pattern in the picture, resulting from interference beats between two sets of periodic structures in the image.

molded capacitor. A capacitor that has been encased in a molded plastic insulating material to keep out moisture.

molecule. The group of atoms which constitutes the smallest particle in which a compound or material can exist separately.

monaural. Literally, using or hearing with one ear. In popular audio engineering usage, however, this term is used to designate a single-channel system where all the sound amplification is of single dimension, as distinguished from a dual (or more) channel system. The word "monophonic" is rapidly replacing monaural in hi-fi terminology.

monitor. A device (receiver, oscilloscope, etc.) used for checking radio or television programs or audio signals.

monkey chatter. Garbled speech or music heard along with a desired program. This type of interference occurs when the side frequencies of an adjacent-channel station beat with the desired station signal.

monochrome. In present-day television parlance, a black and white picture. The word monochrome ordinarily would mean a picture having a single hue.

monochrome bandwidth. In color TV, the monochrome Y signal frequency response band width.

monochrome signal. A signal or portion of a signal which carries only the brightness or luminosity values of a televised image. Produces a black and white picture.

monochrome transmission. A type of TV transmission which can be reproduced in gradations of a single color only.

monophonic. See monaural.

monoscope. A special type of cathode ray tube which produces television picture signals corresponding to the design or picture which has been printed on its screen, This tube is used in television picture signal generators to provide a satisfactory signal source for television receiver test purposes during those times when no television station is on the air.

monotron. A monoscope.

Morse Code. A system of dot and dash signals used in the transmission of messages by radio or wire telegraphy. The International Morse Code (also called the Continental Code) is used universally for radio telegraphy, while the American Morse Code is used only for wire telegraphy.

Morse sounder. A telegraph receiving instrument that produces an audible sound at the beginning and end of each dot and dash. From these sounds a trained operator can read the message.

mosaic. In television, the light-sensitive surface of an iconoscope or other television camera tube. The surface is made up of minute elements which are photo sensitive. Electrons scanned across the area produce current proportional at each instant to the intensity of light striking the point then being scanned.

motion-picture pickup. Use of a television camera to pick up scenes directly from motion-picture film.

motor. A machine that converts electric energy into mechanical energy.

motorboating. Feedback occurring in pulses at a low audio-frequency rate in an audio-frequency amplifier or radio receiver. Resembles sounds made by a motorboat.

motor element. That portion of a loudspeaker or headphone that receives power from the electric system and converts it into mechanical power.

motor generator. An electric motor directly connected to one or more generators to convert a power line voltage to other desired voltages or frequencies.

moving-armature loudspeaker. A magnetic loudspeaker.

moving-coil galvanometer. A galvanometer in which a suspended or pivoted coil is the moving element.

moving-coil instrument. Any instrument in which the moving system is a coil that carries the pointer or mirror, or other indicating device.

moving-coil loudspeaker. A loudspeaker in which a coil carrying the audio-frequency current is directly attached to a moving diaphragm or cone and moves in and out of a magnetic field.

moving-coil meter. A moving coil instrument.

moving-coil microphone. A microphone in which sound moves a coil in or out of a magnetic field, thus producing electrical impulses.

mu. Greek letter μ, used as a symbol for amplification factor, for micron (a unit of length), and for the prefix micro-.

μa, ua. Abbreviation for micro-ampere.

mu factor. Refers to the amplification of a tube. It is the ratio of voltage change between two electrodes with the current remaining constant and the voltage on other electrodes maintained constant. Unless otherwise specified, change in anode voltage with control grid voltage.

Müller tube. A thermionic vacuum tube having an auxiliary cathode or grid connected to the main cathode internally through a high-value resistor. Also written Mueller tube.

multiband antenna. An antenna that responds at more than one frequency band.

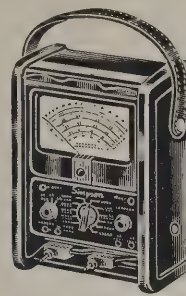
multi-electrode tube. A vacuum tube containing more than five electrodes associated with a single electron stream. These may be hexodes (six), heptodes (seven) or octodes (eight). Examples of heptodes are the pentagrid mixer and the pentagrid converter.

multi-element tube. Two or more sets of elements in the same envelope. Certain elements (plate, cathode or one of the grids), may be common, but two or more independent electron or ion currents are involved. Examples: duo-diode, duo-triode, diode-pentode, duo-diode-pentode.

multigrid tube. A vacuum tube having more than one grid.

multihop transmission. When radio waves reach a given point by being reflected and refracted between the earth and ionosphere several times, the phenomenon is called multihop transmission. Multihop transmission is necessary for radio communication over long distances.

multimeter. A test instrument having a number of different ranges for measuring voltage, current, and resistance. Multitesters and volt-ohm-milliammeters are of this type.



Multimeter

multipath transmissions. Also, multipath effect, ghosts or ghosting. A condition in television receivers where the image has its own reflection. This is caused by the received signal traveling more than one route to the receiving antenna, the signal being reflected from obstacles. As a result, the same signals are received at slightly different times, causing visibly perceptible "ghosts".

multiple connection. The connecting of two or more devices in parallel.

multiple-contact switch. A switch in which the movable contact can be set to any one of a number of fixed contacts.

multiple modulation. A process of modulation in which a carrier wave of one frequency is first modulated by an intelligence signal, and the resultant wave is then made to modulate a second carrier wave having a second frequency, etc. Double modulation is an example.

multiple-purpose tester. See multimeter.

multiple scanning. A process of television scanning in which every other line of a frame is covered during one downward sweep of the scanning beam, and the remaining lines scanned during the next complete sweep. Also referred to as interlaced scanning or multiple interlace.

multiple-unit tube. See multi-element tube.

multiplex. The simultaneous transmission of two or more signals using a common carrier wave or a single path in a telegraph system. A type of multiplex is used in FM broadcasting to silence commercials for paid subscribers. The most recent use of multiplex is for the transmission of stereophonic FM broadcasts.

multiplexer. A color TV circuit which combines the I and Q chrominance signals with the subcarriers in the balanced modulators, which suppress the carrier components. Also mixes the Y, I, Q sync and blanking signals which make up the composite color video signal.

multiplex radio transmission. The simultaneous transmission of two or more signals using a common carrier wave.

multiplier. A resistor used in series with a voltmeter or ohmmeter to increase the range of the meter.

multiplier phototube. A vacuum-type phototube that employs secondary emission and a multiplicity of secondary emission electrodes called dynodes to amplify the electron current emitted from the illuminated photo-cathode. In one tube, an amplification of approximately 2,000,000 is obtained with nine dynodes.

multiplier tube. A multiplier phototube.

multiplying factor. The number by which the reading of a given meter must be multiplied to obtain the true value.

multipolar. Having more than one pair of magnetic poles.

multivibrator. A relaxation oscillator similar to the Eccles-Jordan trigger circuit. Two triodes are capacitance coupled, grid of each to plate of the other, so that the tubes operate alternately. Various saw-tooth or square-wave voltages may be taken from different pairs of electrodes. Used in pulse and sweep applications and as sources of harmonics.

mumetal. A metallic alloy having special magnetic properties. Its permeability is high and its hysteresis loss is low. An excellent material for shielding.

mumetal shield. A core-shaped shield placed around the conical portion of a color picture tube. It prevents external magnetic fields from effecting alignment of the beams in the picture tube.

muting. Silencing, or reducing in volume.

muting switch. A switch used in connection with automatic tuning systems to silence the receiver while tuning from one station to another. Also, a switch on record changers that automatically silences the associated amplifier during the change cycle.

mutual conductance. Transconductance. A conductance (1/R or I/E) involving two circuits. Specifically, the change in plate current in a tube divided by the change in grid voltage which produced it. Vacuum tube constants are so related that mutual conductance is amplification factor divided by AC plate resistance. The commonest formula in which it is used is: $\mu = g_m r_p$.

mutual coupling. When coils are so located that a varying current in one coil will induce a voltage in an adjacent coil, the coils are said to be mutually coupled.

mutual inductance. Between two coils. It is the flux linkage in either coil due to one unit of current in the other.

mutual inductance bridge. A circuit having four impedance arms. Voltage is applied across one arm; consequently, also across the other three arms in series. A mutual inductance occurs between the single connected arm and one of those adjacent to it. Bridge may be used for determining turns ratio of a transformer.

μw. Abbreviation for microwatt.

mv. Abbreviation for millivolt.

mw. Abbreviation for milliwatt.

Mycalex. A hard molded insulating material consisting chiefly of ground mica and lead borate.

N

narrow-band axis. The phase of the chrominance component, (Q signal) with the narrower transmission bandwidth. This bandwidth is 0–.5 mc.

narrow-band FM. Abbreviation for narrow-band frequency modulation.

narrow-band FM adapter. A unit which converts an AM communications receiver to FM reception.

narrow-band frequency modulation. Abbreviated NBFM. A type of frequency modulated telephony which occupies only a fraction of the bandwidth of conventional (wide-band) FM. Narrow-band FM modulation is commonly used for police, fire and taxicab communications, as well as for Amateur communications. Under Federal Communications Commission regulations, 15 kc is the maximum permissible deviation for mobile and other commercial NBFM telephony. A maximum deviation of 3 kc is authorized for Amateur NBFM.

NARTB. Abbreviation for National Association of Radio and Television Broadcasters.

natural frequency. The lowest resonant frequency of an antenna or circuit.

natural wavelength. The wavelength of the natural frequency of an antenna or circuit.

NC. No connection. Used on tube-base diagrams.

needle. 1. That part of a phonograph pickup which converts the variations in the record grooves into mechanical movements which are in turn converted into audio frequency signals by the pickup element. The needle must be carefully shaped to follow faithfully the high-frequency variations in the grooves without causing excessive record wear. 2. The indicating pointer of an instrument.

needle pressure See stylus pressure.

needle scratch. Noise components in the output of a phonograph pickup due to friction of the needle riding in the groove.

needle talk. Sounds produced by vibrations of the phonograph needle and/or other associated parts of a phono pickup—and heard directly from the pickup, not through the amplifier. Also called needle chatter.

negative. A term used to describe a terminal which has more electrons than normal. Electrons flow out of the negative terminal of a voltage source.

negative bias. The use of a voltage which makes the control grid of a radio tube negative with respect to the cathode.

negative charge. A condition of having excess electrons, or in particular, the total charge represented by these electrons.

negative feedback. A circuit arrangement by which a signal is fed back from the plate circuit to the grid circuit 180 degrees out of phase with input signal, thus decreasing the amplification. It is used in audio-frequency circuits to reduce distortion. Also called inverse feedback.

negative feedback amplifier. An amplifier that employs the circuit described under negative feedback.

negative-grid generator. A type of oscillator using negative feedback.

negative image. Reversed television images in which the dark portions of the scene appear bright, and bright portions appear dark.

negative modulation. 1. In an amplitude-modulated television or facsimile system, the form of modulation in which maximum transmitted power corresponds to minimum light intensity at the television camera or maximum density or blackness of the subject copy in facsimile. 2. In a frequency-modulation facsimile system, it is that form of modulation in which the highest transmitter frequency corresponds to the maximum density of the subject copy.

negative picture phase. For a television signal, the condition in which increases in brilliancy make the picture signal voltage swing below the zero level in a negative direction.

negative resistance. A resistance that varies with current so that as the current increases, the voltage drop across the resistance decreases. Arc discharges and dynatron tubes possess such resistance.

negative resistance oscillator. One in which the operation depends on negative resistance elements, usually in the tube. All oscillators may be shown to possess the properties of negative resistance.

negative temperature coefficient. A coefficient giving the fractional amount of *reduction* in the value of a resistor or capacitor, for each degree of increase in temperature. See also *positive temperature coefficient.*

negative transmission. The transmission of television signals in such a way that a decrease in initial light intensity causes an increase in the transmitted power.

negatron. A four-electrode vacuum tube having the characteristics of a negative resistance.

nemo. Television or radio broadcast originating outside the studio requiring the use of portable equipment. Also called a remote.

neon. An inert gas used in neon signs and in some tubes, producing a bright orange-red glow when ionized. Neon-filled tubes are used as voltage regulators.

neon oscillator. A relaxation oscillator comprising a gas lamp, a capacitor and a resistor. Output is sawtooth.

neper. An electro-acoustic unit of power ratio based on ϵ, the Naperian base of logarithms. 1 decibel equals 0.115 nepers, or 1 neper equals 8.686 decibels. It is the natural log of the square root of the ratio of the powers being measured.

network. 1. A system of interconnected resistors, inductors and capacitors or any combination thereof. Common networks are in the form of a bridge, a Δ, an O, a Y, a T or a π. 2. A number of broadcasting stations connected by radio, telephone lines, coaxial cable or radio relay systems. Enables all stations to broadcast the same program simultaneously.

neutralization. The process of nullifying the effects of the interelectrode capacitance of an amplifier tube, by providing an equal capacitance to balance it out in the circuit. Sometimes the capacitance is balanced out by means of an inductor.

neutralize. To balance the feedback voltage of an amplifier stage due to grid-plate capacitance thus preventing regeneration.

neutralized radio-frequency stage. A radio-frequency amplifier stage neutralized so as not to oscillate.

neutralizing capacitor. A capacitor, usually variable, employed to cancel feedback in an amplifier stage.

Neutralizing Tools

neutralizing tool. A small screwdriver or socket wrench for making adjustments in neutralization to prevent regeneration. It is made of a non-metallic substance to avoid body capacitance effects on the adjustment.

neutrodyne. A neutralized amplifier circuit used in early tuned-radio-frequency receivers.

neutron. An electrically neutral particle. Its mass is approximately equal to that of a proton.

newton. Unit of force. A newton equals 100,000 dynes.

Nichrome. An alloy of iron, nickel and chromium, having high resistance. Used extensively in wire-wound resistors and in all types of electric heating elements.

nickel silver. An alloy consisting of copper, nickel and zinc.

Nipkow disc. A flat round plate having one or more spirals of holes around the outer edge and used in early mechanical television systems.

noble gas. One of a group of chemically inert gases, including helium, neon, argon, krypton and xenon. Also called inert gas or rare gas.

noctovision. A television system employing optically invisible rays, usually infrared, for scanning purposes at the transmitter equivalent to that of seeing in the dark.

node. Any point, line, or surface in a stationary-wave system at which the amplitude of the wave-shaping variable is zero. The type of node is usually specified, since there can be nodes of voltage, current, pressure, etc. The corresponding term for maximum amplitude is antinode.

noise. Interference characterized by undesirable random voltages caused by an internal circuit defect or from some external source. In television, this type of interference results in a multitude of black and white spots distributed over the entire picture. It is often called "snow." In radio receivers, noise appears as an audible hissing sound heard along with desired radio programs.

noise filter. A combination of one or more choke coils and capacitors inserted between the power cord plug of a radio receiver and a wall outlet to block noise interference that might otherwise reach the receiver through the power line.

noise level. Volume of noise usually expressed in decibels.

noise limiter. A circuit that cuts off noise peaks that are stronger than the highest peak in the desired signal being received.

noise measurement. Use of a sound level meter to measure the noise loudness in decibels.

noise-reducing antenna system. An antenna system in which the only part capable of picking up signals is the antenna proper, this being erected high enough to be out of the noise-interference zone. The lead-in is a special shielded cable or twisted two-wire line which can pass through the interference zone without picking up noise signals.

noise silencer. A circuit connected into a superheterodyne receiver circuit to reduce the effects of static and man-made interference noises. Used chiefly with communications receivers.

noise suppression. A circuit used in a receiver or amplifier to reduce noise. For example, noise suppression in a receiver reduces noise output during periods of no-signal reception, or between stations. Noise suppressor circuits in amplifiers reduce noise output resulting from old, scratchy or noisy records.

nomograph. A chart or diagram with which equations can be solved graphically by placing a straightedge on the two known values and reading the answer where the straightedge crosses the scale of the unknown values.

non-conductor. An insulating material.

non-corrosive flux. Flux that is free from acid and other substances which might cause corrosion in soldering.

non-inductive capacitor. A capacitor so constructed that it has practically no inductance.

non-inductive circuit. A circuit having practically no inductance.

non-inductive load. A load having no inductance.

non-inductive resistor. A wire-wound resistor constructed to have practically no inductance.

non-inductive winding. A winding made so that one turn or section cancels the field of the next adjacent turn or section. For example, the wire may be doubled before winding.

non-linear. Not directly proportional and hence producing a curve instead of a straight line when plotted on a graph.

non-linear detection. Square law detection. Detection based on the curvature of a tube characteristic. This results in distortion without complete rectification. Either of these effects result in demodulation.

non-linear distortion. Amplitude distortion. Distortion which produces a waveform different in shape from the input waveform. Results from the non-linearity of the device through which the waveform has passed.

non-linear element. An asymmetric unit. A tube, crystal or other component in which the volt-ampere characteristic is not a straight line through the origin.

non-magnetic. Not affected by magnetic fields. Some non-magnetic materials are glass, wood, copper, and paper.

non-magnetic steel. Stainless steel containing chromium, manganese, or nickel, all of which are practically non-magnetic at ordinary temperatures.

non resonant line. A transmission line on which there are no standing waves at the operating frequency. Also called a "flat" line.

non-shorting contact switch. A selector switch in which the width of the movable contact is less than the distance between contacts.

non-sinusoidal wave. A wave whose form differs from that of a sine wave.

non-storage camera tube. A television camera tube in which the picture signal is at each instant proportional to the intensity of the illumination on the corresponding elemental area of the scene at that instant.

non-synchronous vibrator. A half-wave or full-wave vibrator which does not rectify. See synchronous vibrator.

normal cut. An X-cut in a quartz crystal.

normal glow. Glow covering less than the entire area of a cathode. Increase in current spreads the glow without increasing current density. Under normal glow conditions, a tube can retain a nearly constant voltage drop and thus serve as a voltage regulator.

normally closed. A term applied to a magnetically operated switching device or to its contacts, specifying that the device contacts will conduct power when the motor element or magnet is not energized. Term is also applied to keys and switches.

normally open. Opposite of normally closed in that the device contacts will not conduct power when the motor element or magnet is not energized.

north pole. That pole of a magnet at which magnetic lines of force are considered as leaving the magnet; the lines enter the south pole. If the magnet is free to move, its north pole will point south.

novachord. An electronic musical instrument that creates the sounds of an organ by means of oscillator and amplifier circuits.

noval. A type of miniature receiving tube having nine pins.

Novice license. A class of Amateur license issued in the United States. The examination questions for the Novice license are always mailed to the applicant, and the exam is then conducted and supervised by not more than two qualified persons at the home of the applicant or other convenient location. The code examination for this license is also given at the home of the applicant or other convenient location. The written and code examinations for the license are simplified, but licensees have fewer privileges than holders of the General Class and Conditiona Class licenses. Elementary theory and basic rules and regulations are covered in the written examination, and the code sending and receiving examination is at five words per minute. Novice transmitters must be crystal controlled and maximum permissible plate input power is 75 watts; operating frequencies and types of emission are also limited. Novice licensees may operate on the following frequencies: 3700 to 3750 kc (radiotelegraphy only); 7150 to 7200 kc (radiotelegraphy only); 21.1 to 21.25 mc (radiotelegraphy only); 145 to 147 mc (radiotelegraphy or radiotelephony). A Novice license is valid for a period of one year, and is not renewable.

NTSC. Abbreviation for National Television System Committee.

nucleonics. The science dealing with protons or neutrons in the nucleus of the atom; or, with all phenomena associated with the atom nucleus.

nucleus. The central part of an atom. It consists of protons and neutrons, has a positive charge and constitutes practically the entire mass of an atom.

null. Zero.

null indicator. Any device that indicates when current, voltage, or power is zero.

null method. Any method of measurement in which the reading is taken at zero. It may be a visual or audible reading and in the latter case the null is the "no-sound" setting.

O

octal base. A tube base having a central aligning key and eight equally spaced pins. In some cases, not all of the pins are used, but are retained for support. In other cases, where the used pins are sufficient for support, the unused pins are omitted. Regardless of the number of pins, an octal socket is required.

octal socket. A tube socket with openings for eight equally spaced pins, and a slot for the central aligning key of octal base tubes.

octave. The interval between two frequencies having a ratio of 2:1. The reference frequency for music in the United States is 440 cycles and is the musical note A. In Europe the note A is 435 cycles.

octave filter. A band-pass filter which permits the passage of frequencies from a lower limit to twice this value.

octode. An eight-electrode vacuum tube.

OD. Abbreviation for outside diameter.

odd-line interlace. A television scanning system in which each field contains an extra half line. In the regular 525-line picture, each field contains 262.5 lines.

oersted. The unit of magnetic intensity (magnetizing force) in the CGS electro-magnetic system. It is the dyne per unit magnet pole.

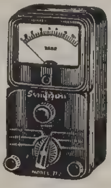
ohm. The practical unit of electrical resistance. It is that resistance in which one volt will maintain a current of one ampere.

ohmic value. Resistance in ohms.

ohmmeter. An instrument for measuring resistance. It consists essentially of a milliammeter in series with a suitable DC voltage and suitable series resistors.

ohmmeter zero adjuster. A potentiometer or other means provided in an ohmmeter to compensate for the gradual reduction of battery voltage with age by reducing the resistance in series with the battery.

Ohm's Law. A fundamental electrical law which expresses the relationship between voltage, current, and resistance in a direct current circuit, or the relationship between voltage, current and impedance in an AC circuit.



Ohmmeter

Ohm's Law for magnetic circuits. States that a DC magnetic circuit is analogous to a DC electric circuit in that magnetic flux (corresponding to flow of current) is established by a magnetomotive force (corresponding to EMF) and is limited by reluctance (corresponding to resistance). Reluctances in series and parallel may be evaluated just as resistances may be figured. Further, the reluctance of a component may be calculated from the length and cross-section area if, in the magnetic case, the permeability is used instead of the conductivity (reciprocal of resistivity).

ohms-per-volt. A sensitivity rating for voltage-measuring instruments, obtained by dividing the resistance of the instrument in ohms at a particular range by the full-scale voltage value at that range. The higher the ohms-per-volt rating, the more sensitive is the meter.

omega. Greek letter Ω representing the word ohm. A small omega (ω) represents radians per recond, $2\pi f$.

omnidirectional. In all directions. An example is the radiation pattern of a vertical antenna.

omnigraph. An instrument for producing Morse code messages for instruction purposes by means of a buzzer and perforated tape.

O-network. A network composed of four impedance branches connected in series to form a closed circuit similar to a squared letter "O".

open circuit. A circuit that is not continuous.

open-circuit jack. A jack whose circuit contacts are normally open and closeable through a properly connected plug.

open-circuit voltage. The voltage at the terminals of a battery or other voltage source when no current is flowing, i.e., when no load is connected across the voltage source.

open core. An iron core fitting inside a coil but having no external return path, so that the magnetic circuit has a long path through air.

operating angle. The electrical angle (portion of a cycle) during which plate current flows in an amplifier or an electronic tube. Operating angles for three types of amplifiers are: class A, 360 degrees; class AB, 180 to 360 degrees; class C, 0 to 180 degrees.

operating point. The point on a grid voltage-plate current characteristic curve of a vacuum tube which corresponds to (a) the direct voltage and current values being used for the grid and the plate (this is the static operating point or quiescent point); (b) the average alternating voltage and current values. The dynamic operating point.

operator. A person whose duties include the adjustment, maintenance and operation of radio equipment.

optical lever. An optical system for measuring small movements by the angular position of a small mirror, attached to the moving part. There are two methods: In one, a beam of light shining on the mirror is reflected onto a distant scale. As the mirror turns, the spot of light moves through twice the angle and the motion is magnified by the large distance from mirror to scale. In the second method, a telescope and scale are placed at a distance in front of the mirror, the telescope being pointed at the mirror but focused on a section of the scale. As the mirror turns, the image in the telescope sweeps across the scale.

optical pattern. See Christmas tree pattern.

optical twinning. A defect occurring in natural quartz crystals resulting in small regions of unusable material that are discarded when cutting up a crystal.

optical view finder. The device which allows the cameraman to frame and focus accurately the desired portion of the scene to be televised.

optics. The branch of physics which deals with the phenomena of light.

optimum. The most favorable degree or condition.

optimum coupling. The degree of coupling in a doubly tuned RF amplifier that provides maximum transfer of signal energy from one circuit to the other.

orbital multiplier. A thermionic secondary emission tube. Electrons given off from the two sides of a disc cathode are accelerated, then bent into two semi-circular paths between two concentric ring electrodes. The two streams of electrons converge on a dynode from whence the secondary electrons are collected on a plate.

orient. To rotate, as an antenna, for best signal pickup.

orioscope. An instrument for locating the electrical axes of a quartz crystal and determining their sense.

orthicon. An orthiconoscope.

orthiconoscope. An improved form of the iconoscope television camera tube. Also called orthicon.

oscillating current. A current that alternately increases and decreases in magnitude and reverses polarity with respect to time in a definite pattern, usually sinusoidal.

oscillation. Fluctuations in a system or circuit, especially those consisting of the flow of charges alternately in opposite directions.

oscillator. 1. Any non-rotating device for setting up and maintaining oscillations of a frequency determined by the physical constants of the system. Examples are vacuum tubes, sparks, or arc generators. 2. In a superheterodyne receiver, that stage which generates a radio-frequency signal of the correct frequency to mix with the incoming signal and produce the intermediate-frequency of the receiver. 3. In a transmitter, the stage that generates the carrier frequency or a frequency equal to some definite multiple of the carrier frequency. 4. A test instrument that can be set to generate an unmodulated or tone-modulated radio-frequency signal at any frequency needed for aligning or servicing radio receivers and amplifiers. 5. A test instrument for generating an audio-frequency signal, at any desired frequency for test purposes. 6. In early radio, a form of generator of radio frequencies that was coupled to an antenna as a radio transmitter. 7. In the very high and ultra-high frequencies, a generator that is coupled to some form of radiator as a transmitter.

oscillator coil. 1. The radio-frequency transformer used in the oscillator circuit of a superheterodyne receiver. 2. The coil associated with any vacuum tube oscillator circuit.

oscillator harmonic interference. Interference occurring in a superheterodyne receiver due to the interaction of incoming signals with harmonics of the local oscillator.

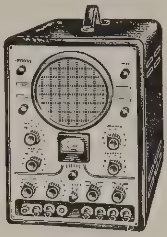
oscillator-mixer-first detector. A single stage of a superheterodyne receiver that functions as a local oscillator and the mixer-first detector.

oscillator padder. An adjustable capacitor used in series with the oscillator tank circuit of a superheterodyne receiver to permit tracking between the oscillator and preselector, or the oscillator and the tuned antenna coil.

oscillogram. The recorder trace or permanent record produced by an oscillograph.

oscillograph. A device, usually containing a cathode-ray tube or AC galvanometers and associated circuits, used to produce a graphic record of rapidly varying electric quantities. See cathode-ray oscilloscope.

oscilloscope. A voltmeter which reproduces on the screen of a cathode-ray tube, traces of the waveforms of one or more rapidly varying quantities. See cathode-ray oscilloscope.



Oscilloscope

osmium. A hard metallic element of the platinum group. Its alloy, with iridium, is used in the manufacture of styli for record playback and cutting.

osophone. A telephone receiver for use by the deaf. It applies sound vibrations directly to the bones of the head.

out of phase. Having waveforms that are of the same frequency but not passing through corresponding values at the same instants.

output. Useful energy delivered.

output impedance. The impedance as measured between the output terminals of a radio device, receiver or amplifier at a definite frequency or at a predominant frequency in the audio range which the device is to handle. For maximum power transfer, the load impedance should match or be equal to this output impedance.

output indicator. A meter or other device connected to an electronic device to indicate variations in signal strength in the output circuits.

output meter. An AC voltmeter connected to the output of a receiver or amplifier to measure output signal strength in volts, decibels or volume units.

output stage. The final stage in a receiver or AF amplifier. In a radio receiver, the output stage feeds the loudspeaker directly. In an AF amplifier, the output stage may feed into one or more loudspeakers, a transmission line, or a cutting head in the case of a sound recording system.

output transformer. The iron-core audio-frequency transformer used to match the output stage of an audio-frequency amplifier to its loudspeaker or other load.

output tube. A power-amplifier tube used in an output stage.

overcutting. Recording on a disc at an excessively high signal level, so that adjacent grooves touch at some points.

overhead cutter. A record cutting head assembly, mounted on a threaded shaft known as the lead screw, suspended directly above the disc. Rotation of the lead screw moves the cutter from the edge of the disc to the center.

overlap. The amount by which the effective height of the scanning spot in a facsimile system exceeds the nominal width of the scanning line.

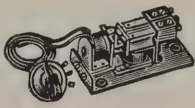
overlap switching. A switching design in a circuit in which the first connection does not release until after the second connection is completed.

overload. A load greater than a device is designed to handle.

overload capacity. The amount of overload a device can handle without undergoing permanent damage.

overload protection. A device for automatic protection against excessive current or voltage.

overload relay. A relay which functions when current in a circuit exceeds the predetermined value. It may be reset electrically or manually.



Overload Relay

overmodulation. Amplitude modulation in excess of 100 per cent. The result is intervals of zero amplitude which produce distortion and spurious radiations.

overscanning. Deflecting the beam of a cathode ray tube beyond normal picture size.

overtone. One of the harmonic frequencies at which a vibrating body can freely vibrate in addition to its lowest fundamental frequency. The first harmonic is the fundamental; the second harmonic is the first overtone.

oxide. An element combined with oxygen. Rust is an oxide of iron.

oxide-coated cathode. A cathode coated with oxides of alkaline-earth metals to improve electron emission at moderate temperatures. Usually barium and strontium.

oxide-coated filament. Any oxide-coated, directly heated cathode.

ozone. A gaseous, allotropic form of oxygen. Usually obtained by discharging electricity into air or oxygen. The odor of ozone resembles that of weak chlorine. Its molecular designation is O_3, as compared to oxygen, which is O_2. Causes the characteristic odor of air after a thunderstorm. Poisonous in any appreciable quantity.

P

P. 1. Designation for the primary winding of a transformer. 2. Designation for the anode or plate of an electron tube. 3. Abbreviation for power.

PA. Abbreviation for public address.

pad. A resistance network used in coupling two impedances. Use of resistance rather than impedance results in a power loss, but gives coupling independent of frequency. A pad may be used as an attenuator.

padder. 1. In a superheterodyne receiver, the trimmer capacitor placed in series with the oscillator tuning circuit to control the receiver calibration at the low-frequency end of a tuning range. 2. Any small capacitor inserted in series with a main capacitor to adjust its capacity to some predetermined value.

Padder

pan. To tilt or otherwise move a television camera vertically and horizontally to keep it trained on a moving object or secure a panoramic effect.

panchromatic. Sensitive to all wave-lengths in the visible spectrum, though not necessarily uniformly so.

panel. A metallic or non-metallic sheet on which the operating controls or components of electronic or electric units are mounted. The standard rack panel is 19″ wide, and usually ⅛″ thick. See rack panel.

panning. Moving a television camera in either vertical or horizontal planes, or a combination of both in order to scan a field of view or keep a moving object in the picture.

panoramic receiver. A radio receiver that permits continuous observation on a cathode ray tube screen of the presence and relative strength of all signals within a wide frequency range above and below the frequency to which the receiver is tuned. Used extensively during the war to monitor all spectra visually since any signal anywhere, so long as received, was immediately apparent. Also adapted to the manufacture of piezoelectric crystals. Used today for visual monitoring of FM signals since deviation can be read directly from cathode ray screen.

paper capacitor. A fixed capacitor consisting of interleaved strips of metal foil separated by an oiled or waxed paper dielectric.

parabola. A type of curve which would be formed by the intersection of a cone and a plane; the plane being parallel to the edge of the cone. It is a hair-pin shaped curve extending to infinity. If this curve were spun about its long axis, a three-dimensional surface would be formed. This is a paraboloid. The parabolic devices used for focusing are paraboloids.

parabolic microphone. A microphone placed at the focal point of a paraboloid sound reflector.

parabolic reflector. A reflector that brings distant parallel rays of light, sound or radiated waves to a focus at a point; or produces a parallel beam when a light, sound or radiated wave source is placed at its focus.

para-curve cone. A loudspeaker diaphragm having a paraboloidal shape, used to secure piston action whereby the entire cone moves as a unit. Also called curvilinear cone.

parallax. The apparent displacement of the position of an object due to a shift in the point of observation. Refers mostly to needles of meters and tuning dials. To eliminate parallax, the eye should be directly over the needle or pointer.

parallel connection. A shunt connection. A method of connecting two or more components into a circuit side by side so that one line terminal is connected to one end at each component (these ends are thus connected together); and the other line terminal is connected to the other side at each component.

parallel cut. A Y cut in a quartz crystal.

parallel-plate oscillator. A push-pull ultrahigh-frequency oscillator circuit making use of two parallel plates as the main frequency-determining elements.

parallel resonant circuit. A tuning circuit consisting of a coil and capacitor connected in parallel. At resonance, it offers a high impedance, so that a large value of signal voltage is developed across it at the frequency to which it is tuned.

parallel-rod oscillator. An ultrahigh-frequency oscillator circuit in which parallel rods of wires (Lecher wires) of required length and dimensions form the tank circuits.

parallel-rod tank circuit. A tank circuit consisting of two parallel rods bridged at their far ends.

parallel-rod tuning. A tuning method used for tuning ultrahigh frequencies, in which the position of a sliding shorting bar on two parallel rods is varied for the purpose of tuning the transmitter, receiver, or oscillator.

paramagnetic. A term used to describe materials with magnetic permeability greater than that of a vacuum. Iron, nickel and cobalt are such materials.

parameter. Any of the resistance, inductance, mutual inductance or capacitance values in an electronic circuit. Hence, a network constant.

paraphase amplifier. A type of amplifier which converts a single-ended input circuit into a push-pull output circuit. Usually called phase inverter.

parasitic arrays. An antenna array containing one or more parasitic elements; *i.e.*,—reflectors, directors, etc., which are not connected to the transmission line.

parasitic element. An antenna element that receives excitation by induction or direct radiation from the driven element and re-radiates the energy in the proper phase relationship to provide the desired directional characteristics.

parasitic oscillations. Unintended self-sustaining oscillations at a frequency different from the operating frequency. Occurs chiefly in vacuum-tube circuits.

parasitic suppressor. A combination of inductance and resistance, usually in parallel, inserted in a grid circuit to suppress parasitic high-frequency oscillations.

Paschen's law. A rule concerning gas discharge tubes which expresses the fact that the ignition potential depends on the product of gas pressure and electrode spacing. Thus, if the pressure were reduced to half, the paths of molecules would be doubled. If now, spacing is doubled, the ignition potential will remain unchanged.

patch cord. A cord equipped with plugs at each end, used to connect two jacks on switchboards.

peak. The maximum instantaneous value of a quantity.

peak inverse anode voltage. The maximum instantaneous anode voltage in the direction opposite to the forward anode voltage. Often applied to the maximum voltage which a rectifier can tolerate without internal arcing between electrodes.

peak load. The maximum load consumed or produced at or in a stated period of time.

peak plate current. The maximum instantaneous plate current flowing in a tube.

peak response. Maximum response.

peak voltage. A maximum voltage which can be applied to electrolytic capacitors for a period not to exceed about 30 seconds. Also called surge voltage.

peak forward anode voltage. The maximum instantaneous anode voltage in the direction in which an electron tube is designed to pass current.

peaking circuit. A type of circuit in which the input voltage is converted into a peaked output waveform.

peaking coil. A type of coil used in the video amplifier stages of a television receiver. They peak the high-frequency response of these stages to assure good definition.

peaking control. A type of fixed or variable resistive-capacitive circuit in a television receiver. It controls the wave shape of the pulses originating at the horizontal oscillator in order to assure a linear sweep.

peaks. Momentary high amplitude levels occurring in electronic equipment.

peak voltmeter. A meter designed to indicate the peak value of alternating voltage. Readings are approximately 1.41 times the rms value in the case of sine waves.

peak-to-peak voltmeter. A meter which indicates the peak-to-peak value of alternating voltage. Readings are 2.82 times the rms value of sine waves.

pea lamp. A low voltage incandescent lamp about the size of a pea.

pedestal. The constant voltage value existing in a television signal just before and after transmission of synchronizing impulses. Also, that portion of the video signal which blanks out the picture tube as the beam returns to the left side of the screen.

pedestal level. A reference direct-voltage value added to the video signal produced by the television camera tube.

pencil tube. A small tube of special design used for operation in the ultra-high-frequency band. Functions as an oscillator or RF amplifier.

pentagrid converter. A pentagrid tube employed as an oscillator-mixer in a superheterodyne receiver.

pentagrid tube. A tube having five grids.

pentatron. A five-electrode vacuum tube containing two anodes.

pentode. A vacuum tube having five electrodes. Ordinarily these will be the cathode, control grid, screen grid, suppressor grid and anode.

percentage modulation. In amplitude modulation, the difference between maximum and minimum amplitudes divided by twice the mean amplitude multiplied by 100. (Max—Min/2 x Mean) x 100 =percentage modulation.

percentage modulation meter. An instrument, either cathode-ray tube or meter, used to measure the percentage of modulation of an amplitude-modulation transmitter.

percent ripple. The ratio of the rms ripple voltage to the algebraic average of the total voltage of a rectifier.

perfect dielectric. A theoretical dielectric material without losses regardless of frequency or potential. A perfect vacuum is the only known perfect dielectric.

peridynamic loudspeaker cabinet. A loudspeaker cabinet baffle designed to provide good bass response by minimizing acoustic standing waves.

period. The time required for one complete cycle of an oscillating or recurring quantity.

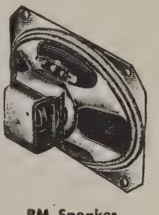
periodic. Recurring at equal intervals of time.

periodic antenna. An antenna in which the impedance varies as the frequency is altered, due to reflections or standing waves within the antenna system. Open-end wires and resonant antennas are examples.

permalloy. An alloy having high magnetic permeability. Composed of 78.5% nickel, 21.5% iron which has an initial permeability of 10,000 and maximum value above 100,000 at a flux density of 5,000 lines/cm_2. Must be formed before heat treating in order to have the above properties.

permanent magnet. An object or magnetic material that has been strongly magnetized and retains its magnetism over a long period of time. Abbreviated PM.

permanent-magnet dynamic loudspeaker. A dynamic or moving-coil loudspeaker in which the magnetic field is produced by a permanent magnet.



PM Speaker

permanent-magnet moving-coil instrument. A meter operated by the reaction between the current in a movable coil and the magnetic field of a fixed permanent magnet. A D'Arsonval meter.

permatron. A thermionic vacuum tube in which the plate current is controlled by a magnetic field instead of a grid.

permeability. The measure of the ease with which a given material can carry magnetic lines of force. Expressed as a multiple of the permeability of air which is 1.

permeability tuning. Tuning of a resonant circuit by changing the inductance of a coil by moving an iron core in or out of the coil.

permeameter. An instrument for measuring the magnetic permeability of materials.

permeance. The reciprocal of reluctance. A measure of the ease with which magnetic flux permeates a material.

perminvar. An alloy of 30% iron, 45% nickel and 25% cobalt which retains constant permeability over an extended interval. For instance the "baked" material may have a permeability of 300 from zero to 3 gilberts/cm_2. Hysteresis losses in this region are practically nil.

permittivity. Specific inductive capacity. It is a measure of the ease with which a given material can carry electric lines of force. Permittivity of a medium is the reciprocal of the force with which two like unit charges repel one another at a distance of one unit when in the medium. The value depends on the system of units used. Relative permittivity or dielectric constant is the ratio of the permittivity of the material to that of a vacuum.

persistence. The measure of the length of time the screen of a cathode ray tube remains luminescent after the excitation is removed. In particular, the time it takes the brightness to fade to 37% of its original value.

persistence of vision. The phenomenon of the human eye whereby we continue to see an object or image for a fraction of a second after it has disappeared. As a result of this ability, the human eye sees apparent continuous motion by watching a series of individual pictures on a television (or movie) screen.

perveance. A quantity which represents saturation current which can flow in a vacuum tube of given geometry. For any shape, the saturation current is proportional to the three-halves power of the applied potential. The perveance is the constant of proportionality.

pf. Abbreviation for power factor.

phanotron. A hot-cathode diode gas-discharge tube, such as an 866A rectifier.

phase. The position at any instant which a periodic wave occupies in its cycle. If amplitude is depicted perpendicular to a time axis, phase may be represented as a position along the time axis. If the time of one period is represented as 360 degrees, the phase position is called a phase angle. Phase angle is also shown as the angle of a rotating vector moving through 360 degrees in one period or cycle. This angle is measured with respect to some fixed direction or to some other rotating vector.

phase control. A variable control used in color TV to synchronize the local receiver sub-carrier to the color burst signal.

phase detector. In television, a circuit which prevents horizontal oscillator frequency shift.

phase difference. Relation between two sinusoidal quantities of the same frequency. It is the fraction of a cycle (not over half) by which one of the waves would have to be moved along the time or frequency axis to make the two waves coincide. One quantity is said to lead or lag the other by the angle of the phase difference.

phase distortion. Any change in phase relationship between voltages or currents independent of frequencies during their reception or passage through any transducer. The ear cannot detect phase distortion, but it is of consequence in television and test circuits.

phase inverter. A vacuum tube stage containing one or more tubes connected between single-sided preceding stages and a succeeding push-pull stage. Converts single-ended input to push-pull output.

phase meter. An instrument which measures the difference in phase between two alternating voltages or currents of the same frequency.

phase modulation. A method of modulating a carrier-frequency current by causing the phase of the modulated signal (with respect to the unmodulated carrier) to vary from instant to instant in accordance with the audio-frequency or other modulation signal.

phase-modulation transmitter. A radio transmitter that transmits a phase-modulated wave.

phaser. In facsimile, a device for adjusting the equipment so that the recorded elemental area bears the same relation to the record sheet as the corresponding transmitted elemental area bears to the subject copy in the direction of the scanning line.

phase reversal. Change in phase of one-half cycle or 180°.

phase reversal switch. A device used on a stereo amplifier, stereo preamplifier, or speaker system for shifting phase of one of the channels 180°. Proper phasing prevents cancellation of bass frequencies.

phase shift. A change in the phase relationship between two periodic quantities.

phase shift bridge. A mutual inductance bridge which is used to measure the ratio of two voltages in both magnitude and phase.

phase shift control. A method of operation of thyratrons, either in an on-off manner, or with variable power. Obtained by controlling the phase of starting during each cycle. Accomplished by an RC or an RL combination in the grid circuit.

phase-splitting circuit. A circuit that produces from the same input wave-form two output waveforms that differ in phase from each other. See phase inverter.

phase velocity. Velocity of a point of constant phase of a wave. Product of frequency and wavelength. May not be equal to the free space velocity of radiation.

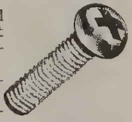
phasing. In facsimile, adjustment of the picture position along the scanning line.

phasing line. The portion of the length of scanning line set aside for the phasing signal in a facsimile system. Also, a section of transmission line used to produce a phase shift.

phasmajector. See monoscope.

phenolic material. A thermosetting insulating plastic material available in many different types and sizes.

phi. Greek letter used as symbol for magnetic flux. Also written as ϕ.



Phillips Screw

Phillips screw. A screw with an indented "cross", instead of the conventional slot recessed in its head, and requiring a Phillips screwdriver to remove or insert it.

phon. A unit of loudness based on the hearing ability of the average human ear.

phone. A headphone. Also refers to radiotelephone transmission.

phonetic alphabet. A series of words used to make spelling out words in radiotelephony clearer.

A—Adam
B—Baker
C—Charlie
D—David
E—Edward
F—Frank
G—George
H—Henry
I—Ida
J—John
K—King
L—Lewis
M—Mary
N—Nancy
O—Otto
P—Peter
Q—Queen
R—Robert
S—Susan
T—Thomas
U—Union
V—Victor
W—William
X—X-ray
Y—Young
Z—Zebra

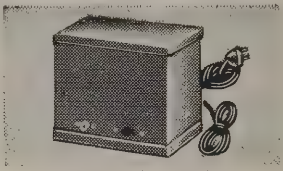
phono adapter. A device that slips under a tube or is otherwise connected to the amplifier associated with a radio receiver, and provides terminals to which an electric phonograph pickup can be connected.

phono cartridge. A small unit containing a crystal, magnetic coil, ceramic element, etc. Cartridges are fitted into tone arms of record-players. The mechanical movement of the styli in the record grooves is transmitted to the crystal or ceramic elements, producing a stress which generates a small voltage. This voltage in turn is fed into the amplifier, and subsequently emerges as audible sound. In the case of magnetic coil cartridges, the movement of the needle traveling in the record groove moves an armature in the magnetic field back and forth, varying the amount of magnetic flux linking the coil and inducing a voltage in the coil. This voltage is then fed into the amplifier in the same fashion as crystal and ceramic cartridges. See also crystal cartridge and magnetic cartridge.

phonograph. A device for converting mechanical vibrations into sound waves. **Electrical Phonograph.** A phonograph in which the motor derives its power from an electrical source. **Mechanical Phonograph.** A phonograph utilizing a hand-wound type of mechanical motor.

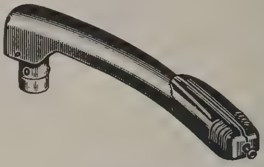
phonograph amplifier. An audio-frequency amplifier for use with a phonograph pickup. See amplifier.

phonograph input. Two terminals connected to the input of the first audio-frequency amplifier stage of a receiver or amplifier for use with a phonograph pickup.



Phonograph Oscillator

phonograph oscillator. A radio-frequency oscillator circuit modulated by a phonograph pickup. The radio receiver picks up the modulated signal and handles it like any regularly received signal, providing audio output of the phonograph record at the loudspeaker. The use of the oscillator eliminates all wires between the phono-oscillator or pickup and the radio receiver.



Phonograph Pickup

phonograph pickup. An electro-mechanical transducer that is actuated by the variations in the grooves of a phonograph record and delivers audio-frequency power to an amplifying system. It consists of a tone arm, a cartridge, and a stylus (needle).

phonograph record. A shellac-composition or vinylite plastic disc (usually 7″, 10″, 12″, or 16″ in diameter) on which sound has been recorded. The 16″ record is often called a transcription.

phosphor. Any substance which becomes luminous as a result of exposure to radiant energy or bombardment by atomic particles. The effect may cease with the exciting stimulus (fluorescence) or may persist (phosphorescence). In the electronic art, the term phosphor is used most commonly to denote those substances (such as zinc silicate) used for the coating of cathode ray screens. These phosphors are produced in a wide variety of colors and a wide range of persistencies.

phosphor bronze. An alloy of copper, tin, and phosphorous.

phosphor-dot faceplate. The glass viewing screen used in the shadow-mask three-gun picture tube. The trios of color phosphor dots are mounted on this face plate.

phosphorescence. Also referred to as persistence and afterglow. A form of light given off by a phosphor after the exciting light or electron stream has ceased. When emission of light is present only during excitation, the result is fluorescence.

photocathode. A surface that emits electrons under the influence of light. Used as a cathode in phototubes.

photocell. See photovoltaic cell. Sometimes incorrectly referred to as a phototube.

photo-conducting cell. A type of photo-cell in which the incidence of light causes a decrease in resistance to current flow through a solid material such as selenium.

photoconductive. A substance which changes its electrical conductivity under varying degrees of illumination is said to be photoconductive. As an example, selenium has approximately eight times as much resistance in the dark as in the light.

photoelectric. Pertaining to the electrical effects of light or similar radiation.

photoelectric cell. 1. A general term applying to any cell whose electrical properties are affected by illumination. 2. A type of photoemissive cell consisting of a vacuum or gas-filled tube having a photo cathode from which electrons are emitted when the surface is exposed to light. See photo-conducting cell and photovoltaic cell.

photoelectric colorimeter. A meter using a photoelectric cell and a set of color filters. The chromaticity coordinates of light of a given sample can be determined from the relative output currents of the photoelectric cell for the different filters.

photoelectric door opener. A photoelectric control used to actuate a door-opening system.

photoelectric electron-multiplier tube. A vacuum-type phototube that employs secondary emission. The electron stream emitted from an illuminated photo-cathode impinges on a series of secondary emitting electrodes called dynodes which add electrons to the stream. Amplifications as high as 10^5 are common. Also called electron-multiplier phototube and multiplier phototube.

photoelectric emission. Emission of electrons from a body under the influence of suitable radiation.

photoemissive. Descriptive term for a substance which emits electrons when struck by light *e.g.*, cesium, rubidium, etc.

photo-ionization. Ionization occurring in a gas as a result of visible light or ultraviolet radiation.

photo-island grid. The photosensitive surface in the Farnsworth dissector tube for television cameras.

photon. A quantum. A corpuscle of radiant energy which has energy equal to h times the frequency; h is the Planck constant; 6.624x10^{-27} erg sec.

photophone. An instrument for transmitting sound over short distances by means of a beam of light.

photosensitive. Also referred to as light-sensitive. A substance that converts light variations into electrical variations when irradiated.

phototelegraphy. Transmission of photographs or other single images over a radio or wire communication system.

phototube. A two-element glass vacuum tube whose cathode emits electrons when light falls on it; the electrons being attracted to the anode when a positive potential is applied to it. Commonly used in sound motion picture projectors and light-operated relay circuits. Also frequently but incorrectly called photocell.

Phototube

phototube relay. An electrical relay used in the operation and control of mechanical devices, such as counters and safety controls, by a beam of light on a phototube.

photovoltaic cell. Photronic cell or barrier-layer cell. A light-sensitive cell capable of generating a voltage when exposed to visible or other radiation. Copper-cuprous oxide or silver-selenium are common types.

pi. Greek letter π, used to designate 3.1416, which is the ratio of the circumference of a circle to its diameter and has many algebraic and electrical applications.

pickup. A mechanical device that converts some form of intelligence into a corresponding electrical signal. See phono pickup. Also called transducer.

pickup arm. A long, narrow device employed on record changers, record players and record turntables. One end of the pickup arm is mounted on a pivot that permits free movement in both the lateral and vertical planes. The other end of the arm holds a cartridge with stylus (needle). As the record revolves the stylus comes in contact with the record grooves and transmits the sound material represented by the grooves to the cartridge where it is converted to electrical energy.

picofarad. Same as micromicrofarad. This term is used in some European countries. Abbreviated Pfd.

pictorial wiring diagram. A wiring diagram containing actual sketches of radio parts and showing clearly all connections between the parts.

picture black. The signal produced at any point in a facsimile system by the scanning of a selected area of subject copy having maximum density.

picture dot. In color television, the basic—or picture element area of each color pulse. In a typical color system, there may be 3,800,000 pulses for each of the three primary colors every second.

picture element. The smallest subdivision of a television image, arbitrarily defined by assuming equal vertical and horizontal resolution and having a dimension equal to the width of one scanning line.

picture filter. A sheet of colored glass or plastic placed in front of a television screen to improve contrast.

picture frequency. The number of complete pictures that are scanned per second in a television system. It has been standardized at 30 per second in the United States.

picture receiver. A receiver for television pictures only, having no facilities for receiving the associated sound.

picture signal. In television, the radio-frequency carrier which contains the picture elements of the program being televised.

picture synchronizing impulse. The impulse that controls the time at which the scanning beam in a television receiver returns from the bottom of the reproduced image to the top for the start of a new vertical sweep.

picture transmission. The electrical transmission, either over wires or through space by radio, of a picture having a graduation of shade values as distinguished from facsimile which involves usually only black and white.

picture tube. The image-reproducing cathode-ray tube in a television receiver. See kinescope.

picture white. The signal produced at any point in a facsimile system by the scanning of a selected area of subject copy having minimum density.

Pierce oscillator. A crystal oscillator circuit in which a crystal is connected between the grid and plate of the oscillator tube.

pie winding. A method of constructing coils from a number of individual washer-shaped coils called pies. Also called pi (π) winding. See illustration of radio-frequency choke.

piezoelectric. Literally, pressure electricity. Property of some crystals which have the ability to generate a voltage when mechanical force is applied, and the converse ability to produce a mechanical force by expanding or contracting when a voltage is applied.

piezoelectric loudspeaker. A speaker operating by the mechanical dilations and contractions obtained in a piezoelectric element such as a Rochelle salt crystal.

piezoelectric microphone. A crystal microphone.

piezoelectric oscillator. A crystal oscillator in which the crystal controls the frequency of oscillation.

piezoelectric pickup. A crystal-type phonograph pickup.

piezoelectric resonator. A plate or rod of natural quartz or other piezoelectrical crystal which may be electrically excited into resonant vibration, usually at a precise frequency.

pigtail. A flexible metallic connection usually consisting of braided wire used between a stationary terminal and a terminal having a limited range of motion.

pilot lamp. A small lamp used to illuminate the tuning dial of electronic equipment or to indicate when the equipment is turned on.

pin connections. Connections made to pins of a vacuum tube. The following abbreviations are used to identify pin connections: NC—no connection; IS—internal shield; IC—internal connection (but no electrode connection); P—plate; G—grid; SG—screen grid; SU—suppressor; K—cathode; H—heater; F—filament; RC—ray-control electrode; TA—target.

pine-tree array. An array of dipole antennas aligned in a vertical plane known as the radiating curtain with a second array containing corresponding half-wave antennas parallel to and a quarter wavelength behind, forming a reflecting curtain. Such an array operates at only one fixed frequency.

pi network. A network of three impedances, two across the line and the third inserted in one line between the two so as to simulate the Greek letter π.

pin jack. A jack having a small opening into which a plug tipped with a metal pin can be inserted.

pip. Popular term for a pulse or peak on a pattern of a cathode ray tube screen.

pipe line. A long metal tube having at its center a conductor supported by insulators. Also called a coaxial cable, coaxial line, coax, concentric line, etc.

piston action. The manner in which the cone or diaphragm of a loudspeaker moves when driven at bass audio frequencies.

pitch. 1. The property of a tone which is determined by its frequency. The higher the tone, the higher the pitch. 2. The distance between two adjacent threads of a screw.

planar mask. See shadow mask.

plan position indicator. A cathode-ray tube and associated circuits employed in radar and sonar systems, to indicate the position of targets simultaneously through 360 degrees.

plastics. A class consisting of a large variety of substances formed by polymerization. Liquids or vapors, made up of small molecules, are caused to combine chemically into enormous molecules which form highly inert solids having unique insulating properties. Plastics are molded during formation but may be machined later. Many may be softened by heat. Plastics have many uses in the field of electronics.

plate. 1. The common name for the principal anode of a vacuum tube. 2. One of the conductive electrodes of a capacitor. 3. One of the electrodes of a storage battery. 4. Colloquialism for a piezoelectric crystal.

plate bypass capacitor. A capacitor connected to the plate circuit of a vacuum tube to bypass high frequency currents.

plate characteristic. A graph showing the plate current of a vacuum tube as affected by changes in plate voltage.

plate circuit. A circuit including the plate voltage source and all other parts connected between the cathode and plate terminals of a radio tube.

plate circuit efficiency. AC energy delivered to the load is derived from DC energy of the plate power supply. The ratio of these quantities is the plate efficiency of an amplifier. DC energy delivered to the load is wasted, therefore efficiency increases with negative grid bias from less than 25% for class A to as high as 90% for class C.

plate current. The electron flow from the cathode to the plate inside a tube and in the plate circuit outside the tube.

plate detection. Detection in which rectification of the radio frequency signals takes place in the plate circuit of a vacuum tube.

plate dissipation. The amount of power lost as heat in the plate of a vacuum tube.

plate efficiency. See plate circuit efficiency.

plate impedance. A term used when referring to the ratio of voltage over current in the plate circuit of a final transmitter amplifier, for purposes of matching a modulator. Frequently used interchangeably, but incorrectly with plate resistance.

plate input power. The product of the direct voltage applied to the plate times the current flowing to the plate, measured without modulation.

plate keying. The keying of a radiotelegraph transmitter in the plate supply circuit.

plate load impedance. The impedance to current flow in the external circuit of a vacuum tube between its plate and cathode.

plate modulation. The introduction of the modulating wave into the plate circuit of any tube in which the carrier frequency wave is present.

plate resistance. The ratio of a small change in plate voltage divided by a small change in plate current, in vacuum tube circuits. The symbol is Rp.

plate saturation. See saturation.

plate supply. The voltage source used in a vacuum tube circuit to place the plate at a high positive potential with respect to the cathode

plate-to-plate impedance. The load impedance measured between the plates of a push-pull amplifier stage.

plate voltage. The direct voltage between the plate and the cathode of a vacuum tube.

playback. Playing of a recording.

playback reproducer. A phonograph pickup.

pliodynatron. An early secondary emission amplifier and oscillator tube similar to a dynatron, but having a second grid used for control purposes.

plug. A connecting device used for making an instantly removable connection to a corresponding terminal jack or outlet.

plug-in. Having terminals such that connections are made automatically by plugging the device into a socket or series of jacks.

plug-in coil. A coil having as its terminals a number of prongs arranged to fit into a socket mounted on the radio chassis.

plug-in resistor. A fixed resistor having terminals arranged for plugging into a socket or jacks.

plumbing. Familiar slang term for microwave coax or wave guide circuits.

plus sign (+). The plus sign is used to indicate addition or a plus value. Indicate positive polarity or the positive terminal of a device.

Plug-In Coil

PM. 1. Abbreviation for permanent magnet. 2. Abbreviation for phase modulation.

pointer. The needle-shaped rod that moves over the scale of a meter or tuning dial.

point-to-point communication. Radio communication between two definite fixed stations.

poison. 1. In television or electronics, a substance that reduces phosphorescence in a luminescent material such as zinc sulphide which covers the screen of a cathode ray tube. 2. A contaminant which reduces emission of a cathode surface.

polar diagram. A graph in which the two coordinates are an angle and a length. Examples: impedance diagrams, plots of antenna patterns, microphone sensitivity patterns, amplifier charts showing lead or lag as a function of frequency.

polarity. 1. An electrical condition determining the direction in which current tends to flow. Applied to direct current sources; also to components when connected in DC circuits. 2. The quality of having two opposite charges, one positive and the other negative. 3. The quality of having two opposite magnetic poles, one north and one south.

polarity indicator. An instrument used to identify the positive and negative terminals in a direct current circuit. An example would be a direct current voltmeter.

polarization. 1. A condition which arises at the electrodes of voltaic or electrolytic cells as a result of the passage of current. The condition consists of an accumulation of gas or other resistive material on the electrode surface. Objectionable in voltaic cells such as dry cells. The basis for operation of electrolytic rectifiers and capacitors. 2. In waves, an orientation of the wave (or in electromagnetic radiation, the magnetic vector) such that it is in a plane (plane polarization) or that it is in a plane which rotates (elliptical or circular polarization). Polarization in a radio radiation is usually the result of emission from the antenna, but polarization by reflection also occurs.

polarized meter. A meter for direct current circuits, having a pointer resting at mid-scale zero. Deflection depends on the direction of the current flow. The ammeter on an auto dashboard is a good example.

polarized relay. A relay in which direction of movement of the armature depends on the direction of the current in the circuit controlling the armature.

pole. One end of a magnet. One electrode of a battery.

pole piece. A section of ferromagnetic material forming one end of an electromagnet or permanent magnet.

polyethylene. A tough, flexible, plastic compound having excellent insulating properties, even at the ultra-high frequencies. Polyethylene is widely used as the insulating material in coaxial cable and twin line.

polyiron. A substance composed of minute granules of iron separated by an insulating binder.

polyphase. A term widely applied in electrical power engineering to generators, distribution lines, rectifiers and motors. Polyphase circuits usually involve three (or multiples of three) alternating voltages, spaced 120° (or submultiples of 120°) apart. Advantages are (a) availability of single phase with economy of wire; (b) smoothness and ease of filtering after rectification.

polyphase transformer. A transformer designed for polyphase circuits. Examples are the delta and wye types.

polystyrene. A clear thermoplastic material having excellent dielectric properties especially at high frequencies.

porcelain. A glazed ceramic insulating material.

port. A vent used in a bass-reflex speaker enclosure. The size of the port is determined by the volume of the enclosure and the free cone resonance of the speaker used. The port minimizes resonance to provide smoother response.

portable receiver. A completely self-contained radio receiver having the loudspeaker, all necessary batteries, and a loop antenna built into a compact carrying case. Terminals are sometimes provided for external antenna and ground connections.

portable recorder. A sound recorder built into a carrying case and designed for portable operation.

portable transmitter. A complete radio transmitter designed so that it can be readily transported from place to place.

positive. A term used to describe a terminal having fewer electrons than normal, so that it attracts electrons in seeking to return to its normal state. Thus, electrons flow into the positive terminal of a voltage source.

positive bias. The condition in which the control grid is positive with respect to the cathode of a vacuum tube.

positive feedback. Feedback that increases amplification or sustains oscillations. Also called regeneration.

positive grid. A grid positive with respect to the cathode.

positive grid oscillator. Barkhausen-Kurz tube. A triode oscillator capable of generating frequencies up to about 5,000 mc. Limited in frequency by transit time of electrons oscillating back and forth about the grid.

positive modulation. The form of modulation in which maximum transmitted power or highest transmitted frequency (for FM) corresponds to maximum light intensity at the television camera or minimum density of the subject copy in facsimile.

positive picture phase. A condition in which increase in brilliancy of the object being televised causes the picture signal voltage to increase above the zero level in a positive direction.

positive plate. The positive terminal of a battery.

positive terminal. The terminal of a battery or other voltage source toward which electrons flow in the external circuit.

positive temperature coefficient. A characteristic where the resistance or capacity of a substance increases when temperature is increased. All metals and most alloys have this property. Carbon has a negative temperature coefficient. The coefficient itself is a number indicating the fractional increase of resistance or capacity per degree rise in temperature. See negative temperature coefficient.

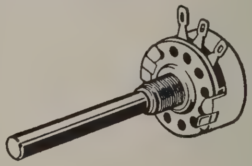
positive transmission. Also known as positive modulation. A type of television transmission in which maximum radiated power from the transmitter corresponds to maximum white area in the image; dark portions of the picture cause a decrease in radiated power. This system is not used in the United States.

post deflection focus. In the Chromatron single-gun color TV picture tube, a method used to converge the beam to a point after it has been deflected.

potential. Voltage. The work per unit charge required to bring any charge to the point at which the potential exists. The number of volts is the joules per coulomb.

potential difference. The difference in voltage at two points.

potential divider. See voltage divider.



Potentiometer

potentiometer. 1. A popular term for a variable resistor. Radio pots usually have a ring-shaped resistance unit with an adjustable arm. Laboratory models are larger, straight and tubular. The device may be connected as a variable resistor (one end and movable contact) or as a voltage divider (both ends and movable contact). 2. A standard instrument of high precision used for measuring DC potential (and thereby current or resistance). Measurement is by a null method so that no power is transferred to or from the unit under investigation by the instrument.

powdered iron core. A core consisting of powdered magnetic material mixed in a suitable matrix and pressed into the required shape.

power. Rate of doing work. Energy per unit time. May be expressed in horsepower (550 foot pounds per second).

More often in the electrical field it is expressed in watts (joules per second) or in kilowatts (thousands of watts).

power amplification. A ratio of the power output of an amplifier to the power supplied to the input circuit.

power amplifier. 1. An audio or radio frequency amplifier designed to deliver a relatively large amount of output energy. 2. The last stage of an amplifier as distinguished from previous stages usually classed as voltage amplifiers. Here signal currents appear, so power (EI) is amplified.

power converter. A dynamotor or vibrator unit for inverting DC power to AC. Used for AC operation of radios, tape recorders, television sets, phono motors, etc., in localities where only DC power is available.

power cord. A two-wire flexible cable for connecting such equipment as radio or television receivers, electrical appliances, etc., to an outlet. Also called line cord.

power detector. A linear detector circuit that will handle strong input signals without objectionable distortion.

power factor. A rating obtained by dividing the resistance of a part or circuit by its impedance at the operating frequency. A resistor has a power factor of 1; high-quality capacitors and coils have very nearly zero power factor. Power factor is the cosine of the phase angle between voltage and current. Abbreviated p. f.

power factor correction. Adding capacitors to an inductive circuit to increase the power factor. The capacitors make the total current in the circuit more nearly in phase with the applied voltage.

power factor meter. An instrument with scale graduated in percentages for measuring power factor.

power gain. The ratio of two powers such as output to input of a vacuum tube or output to input of an audio frequency amplifier. 2. The ratio of field strength of an antenna under test to a standard comparison antenna. Usually expressed in decibels.

power level. The amount of electrical power passing through a given point in a circuit. Power level can be expressed in watts, in decibels, or in volume units.

power level indicator. An AC voltmeter which is calibrated to read in terms of audio power level.

power line. Two or more wires used for conducting power from one location to another.

power output. The power in watts delivered by an amplifier to a load, such as a speaker.

power output tube. A radio tube especially designed for use in the AF output stage of a radio system. It is capable of handling much greater current than the ordinary amplifier tube, and hence delivers high output power.

power pack. The power supply unit of a radio receiver, amplifier, transmitter, or other radio apparatus. Its function is to convert the available power line or storage battery voltage to the values required by filament, grid and plate circuits.

power rating. The power available at the output terminals of a device such as a tube or an iron-core transformer when the device is operated according to manufacturer's specifications both as to input and output load.

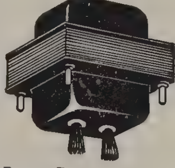
power ratio. The ratio of the power output to the power input of a device. Usually expressed in decibels loss or gain.

power sensitivity. An index of power amplifier performance. It is the ratio of signal frequency output power to the square of the effective input voltage. This is expressed as a conductance in mhos.

power switch. The main switch in a radio or television receiver, transmitter or other electrical device. Used to connect or disconnect the unit from the power supply lines. Also called an on-off switch.

power transformer. An iron core transformer having a primary winding usually connected to an alternating current power line and having a number of secondary windings that provide different alternating current voltage values.

power tube. A tube that is capable of handling greater amounts of current and power than ordinary voltage amplifier tubes. This type of tube is used in the last stage of an audio-frequency amplifier or in the high-power stages of a radio transmitter.



Power Transformer

preamplifier. An extra stage of amplification at the front end of an amplifier or receiver. Also a separate booster unit employed with amateur receivers or television sets for strengthening weak signals. Typical example; a preamplifier used to increase the output of low-output magnetic cartridges in phono players.

preemphasis. The increase of the relative strength of higher audio frequencies as, for instance, at a transmitter of the frequency modulated type. After deemphasis at the receiver, the net result is an increase in signal-to-noise ratio. Used in disc recording to subdue record scratch.

preselector. A tuned-radio-frequency amplifier or antenna tuning device inserted between the radio receiver input terminals and the antenna lead-in to increase the amplitude of the incoming signal.

presence. A term used in high-fidelity to indicate the realism of the reproduced sound. The music is said to have "presence" if the listener gets the impression that the actual performance is taking place in his own home.

presence control. A potentiometer on a three-way high-fidelity speaker system which is used for adjustment of the relative volume level of the mid-range speaker.

pressing. The process of making a phonograph record.

pressure microphone. A microphone in which the electrical response is caused by variation in pressure of the actuating sound wave. A piezoelectric microphone.

pri. Abbreviation for primary.

primary. 1. First in order of time, placement, development or importance. 2. The transformer winding which receives the energy from a supply circuit. Also called the input.

primary battery. A battery of one or more primary cells.

primary cell. A type of cell in which the generated voltage is due to permanent chemical changes in the cell material. A primary cell cannot be recharged. This is the earliest known type of cell.

primary color. A color that can be mixed with other colors to form a variety of hues required for color TV. Three primary colors are used as these are sufficient to match most natural hues.

primary emission. Streams of electrons or cathode rays which are released by a heated or lighted cathode.

primary service area. The area around a broadcast station where the ground wave is not subject to objectionable fading or interference.

primary standard. A unit established by some authority or developed through practical and exact application of a formula. Secondary standards are calibrated against the primary standard.

primary voltage. The voltage applied to the input terminals of a transformer.

primary winding. The input winding of a transformer.

printed circuit switch. A special type of rotary switching device which may be plugged directly into a matching printed circuit board. The use of printed circuit switches simplifies assembly of electronic equipment by completely eliminating complicated wire to switch terminals. These switches are used extensively in Knight-Kit electronic kits.

printed circuit technique. A method by which circuit connections and many of the components are printed or painted on a plane surface with conductive or resistive media. Permits building extremely compact circuits.

print-through. The transfer of a portion of the magnetically recorded material, from layer to layer, on a reel of recording tape. Print-through manifests itself as a low-level background sound occurring during soft passages. It is a kind of sound "ghost."

progressive interlace. In television, a method of interlaced scanning in which the first line of the picture is scanned as the first line of the first field; the second line is scanned as the first line of the second field, the third line is scanned as the first line of the third field, etc.

progressive scanning. Coverage of all of the elements of a picture by a series of horizontal sweeps of the beam from left to right, successive sweeps covering adjacent areas progressing from top to bottom.

purity. Freedom from mixture with white or any other color primary. A pure color. See color saturation.

purity coil. In color TV, this coil is used to adjust the axis of the 3 beams so that the spots accurately strike the color dots on the screen of the picture tube.

purity control. A potentiometer connected as a voltage-divider across the low-voltage power supply. It adjusts the DC voltage applied to the purity coil for obtaining best color purity of the beams.

projection cathode-ray tube. A special cathode-ray tube that will produce an image that can be projected by lenses or a combination of lenses and mirrors.

projection television. A method for viewing television reception by means of a system of lenses (using convex lenses or concave reflectors) wherein the image of a kinescope (usually with small face but extremely bright picture) is projected onto the back of a translucent screen or front of a standard movie screen.

projector. A uni-directional horn used with a loudspeaker.

propagation. The travel of electromagnetic waves or sound waves through a medium.

protective gap. The space between two terminals across which transient voltages may arc.

protective resistance. A resistor used to limit current flow to a predetermined safe value.

proton. A particle having a charge of plus one and a mass of one in atomic units. This charge is equal to the magnitude of the charge of an electron. The mass of the proton is 1850 times that of an electron. Protons and neutrons make up the nuclei of matter. The positive ion of atomic hydrogen is a proton.

proximity effect. The non-uniform distribution of current in the cross-section of a conductor due to changes of current in a neighboring conductor.

public-address amplifier. An audio-frequency amplifier capable of giving adequate sound coverage (when used with appropriate loudspeakers) at a public gathering. Abbreviated P. A. (or PA) amplifier.

public-address system. A public address amplifier plus all accessories such as power supplies, microphones and loudspeakers. Abbreviated P. A. (or PA) system.

pulling. 1. Forcing frequency of an oscillator by some form of coupling or loading to change toward another frequency 2. In television, partial loss of sync.

pull-up current. Also called pull-in current. The amplitude of current required to operate a relay.

pulsating current. A uni-directional current that has a component of alternating current.

pulsating direct current. A uni-directional current that changes in value at regular or irregular intervals.

pulse. A brief surge of voltage or current. May be recurrent but is not cyclic except in the sense of a highly distorted waveform.

pulse-modulated waves. Recurrent wave trains whose duration is shorter than the interval between them. Used in radar.

pulser. Electronic equipment for the production of high voltage pulses of extremely short duration occurring at definite recurrence rates. Used in radar and similar systems.

pulse-code modulation. A system of modulation in which the presence or absence of certain groups of pulses is a function of the amplitude of the modulating signal. PCM systems have very good signal-to-noise ratios.

pulse-time modulation. Transmission of pulses, with the interval between pulses varied in accordance with modulation. Abbreviated as PTM. Also called pulse position modulation, PPM.

pulse-width modulation. A system of modulation in which the amplitude of the modulating signal determines the width of the transmitted pulses.

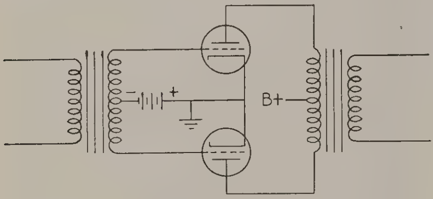
puncture. The breakdown of insulation as a result of high voltage.

pure tone. A sound produced by sinusoidal sound waves of a single frequency. Examples: tone of a tuning fork struck lightly; a flute blown softly.

push-back hook-up wire. Tinned copper hook-up wire covered with insulation which can be pushed back easily to expose bare wire for a connection.

push-button control. Control of electrical or electronic equipment by means of push-buttons which in turn operate relays, switches, etc.

push-button tuner. A tuning unit which automatically tunes a radio receiver to a station when the button assigned to that station is pressed. In electrical automatic push-button tuning, the button actuates switches which connect a set of pre-adjusted trimmer capacitors into the receiver tuning circuits. In electromechanical automatic push-button tuning, the button controls the starting and stopping circuits of a small motor which rotates the regular gang tuning capacitor of the receiver. In mechanical automatic push-button tuning, pressure on the button is transferred by a lever or cam system into a force which rotates the gang tuning capacitor to the correct position for the desired station.



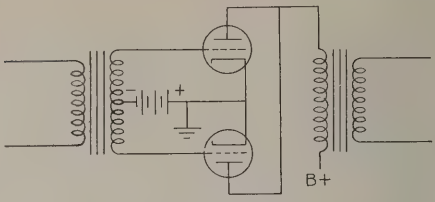
Push-Pull Circuit

push-pull circuit. A two-tube amplifier circuit in which the grid and plate of one tube is operating 180° out of phase with the grid and plate of the other tube, as against parallel operation in which the grids are connected together and the plates are connected together. Push-pull operation generally results in higher output efficiency. Even order (2nd, 4th, etc.) harmonics are cancelled out. Hum in the plate supply circuit is balanced out. Push-pull circuits are used at both audio and radio frequencies.

push-pull oscillator. A vacuum-tube oscillator containing two tubes or a double-section tube connected in a phase relation similar to that of a push-pull amplifier.

push-pull parallel circuit. A vacuum tube circuit consisting of four tubes (or two double section tubes) wherein the tubes are paired off in two's and connected grid and plates in parallel and then treated as two single tubes connected in push-pull. Mostly used in high-powered amplifiers.

push-pull transformer. An iron-core AF transformer designed for use in a push-pull amplifier circuit. If it is the input transformer, it will have a center-tapped secondary winding. If it is the output transformer, it will have a center-tapped primary winding.



Push-Push Circuit

push-push circuit. A two-tube amplifier circuit in which the grid of one tube operates 180° out of phase with the grid of the other tube, but the plates are connected together. Noted for fairly high efficiency when used for frequency doubling in radio frequency power amplifiers.

pyromagnetic. Having to do with the action and effects of heat and magnetism on each other.

Q

Q. 1. A quality factor rating applied to a coil or resonant circuit. Q is defined as the inductive reactance divided by the resistance. Also called Q factor. 2. Charge or quantity of electricity.

Q-signal. A three-letter abbreviation starting with Q, used in the International List of Abbreviations for radiotelegraphy, to represent complete sentences. When the signal is followed by a question mark, the question form of the sentence is intended. Thus, QRT means "Stop transmission," and QRT? means "Shall I stop transmitting?" In color TV, part of the chrominance signal portion of a color TV signal which also includes the I signal. At the transmitter, the quadrature-phase component of the chrominance sub carrier is modulated by the Q video signal and balanced modulator so that the subcarrier is suppressed leaving the sidebands to become part of the overall composite video signal. The Q signal band width is 0–.5 mc. Y, I and Q signals are transmission primaries.

QCW signal. A quadrature-phase subcarrier signal.

QSL Card. A card exchanged by Radio Amateurs to confirm radio communication with each other.

quadrature. Displaced 90° in phase angle. This is expressed by use of the letter *j*, which may be considered as an operator producing a rotation of 90° counterclockwise. Since *j* equals the square root of minus one, the square of *j* equals minus one. Thus two such operations would result in rotation of 180° or from plus to minus. An additional rotation of 90° (total 270°) results in minus *j*. In color TV the Q chrominance signal is called the quadrature signal as its phase is 90° from that of the in-phase subcarrier component.

quadrature amplifier. In color TV, an amplifier stage which introduces a 90° phase shift as a signal passes through it. It is used to amplify the 3.58 mc chrominance subcarrier and shift its phase 90° so that it may be used in the Q demodulator.

quantity of electricity. 1. Electrical charge stored in a capacitor and designated by the symbol Q. 2. Current flowing multiplied by time; may be measured in coulombs. One coulomb is the charge transferred by one ampere flowing for one second.

quarter-wave antenna. An antenna electrically equal to one-fourth the wavelength of the signal to be transmitted or received.

quarter-wavelength transformer. A one-quarter wavelength section of a transmission line, used as an impedance-matching device for transmission or reception.

quarter-wave transmission line. A transmission line that is an electrical quarter-wavelength of the frequency for which it is designed.

quartz. A mineral occurring in hexagonal needle-like crystals in its natural form; used in piezo-electric or "crystal" oscillators.

quartz crystal. A thin square or rectangular slice of quartz which, when precision-ground and smoothed, will vibrate at a frequency determined by its thickness and its original position in the natural quartz. Used to maintain high frequency stability in a vacuum tube oscillator of a transmitter or receiver.

quartz oscillator. A quartz crystal-controlled vacuum tube oscillator.

quenched gap. A spark gap made up of large closely spaced plates. Rapid de-ionization of air between the plates increases resistance of the transformer circuit in order to allow the spark to oscillate more freely. Spark transmission is now obsolete.

quenching frequency. A locally generated frequency produced in a superregenerative detector stage at regular intervals to prevent oscillation during reception of strong signals.

quick-break fuse. A fuse that opens a circuit rapidly when it is overloaded. Usually, the ends of the melted fused wire are quickly separated by means of a spring or weight.

quick-break switch. A switch that breaks a circuit rapidly and independently of the rate at which the switch handle is moved to minimize arcing.

quiescent carrier telephony. A radio-telephony system in which the carrier is suppressed whenever there are no voice signals to be transmitted.

quiescent operating point. That value of voltage and current which is characteristic of the no-signal condition of a vacuum tube.

quiescent push-pull. A characteristic of the push-pull circuit in a radio receiver which results in practically no current flow when no signal is being received. There is thus no noise during tuning between stations.

quiet automatic volume control. Delayed automatic volume control, which does not act until a certain signal strength is reached and which hence does not apply full amplification to background noise when tuning between stations.

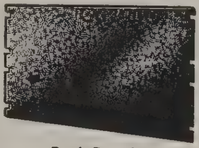
quieting. The measure of an FM tuner's ability to minimize noise and static. Quieting is expressed in decibels and closely associated with tuner sensitivity. With a given signal input (expressed in microvolts), the greater the tuner sensitivity, the greater is the quieting action.

quiet tuning. Having provisions for silencing the output of a radio receiver at all times except when it is accurately tuned to an incoming carrier wave.

R

R. 1. Letter used to denote resistance in ohms. 2. Symbol for resistor in a schematic diagram.

rack panel. A standard metal or non-metal panel upon which is mounted radio or telephone electronic equipment. It fits into relay racks or rack cabinets. Standard width is 19″; available in various heights which are always multiples of 1¾″. Mounting notches are standard, to fit multiple-drilled racks and cabinets. See panel.



Rack Panel

radar. Coined from the phrase, "Radio Detection and Ranging." Originally developed for wartime use, now widely used in peacetime applications, particularly in marine and aeronautical navigation, missile and satellite tracking systems, aircraft warning systems, etc. Navigational aids such as Ground Control Approach (GCA) systems, and the absolute altimeter, all use radar principles. A system for determining the presence and location of a distant object (target) by transmitting high-power micro-wave pulses which are reflected back by the object to the radar unit. This reflected energy or "echo" appears as a "pip" on the screen of a cathode-ray tube; the position of this pip on a calibrated time axis indicates the distance of the target from the radar unit. Position of the radar antenna at the time of detection indicates the bearing of the target in relation to the radar unit. Another form of presentation on the scope screen (PPI, or Planned Position Indicator), shows distance from the center of the screen as a function of angle (of the rotating beam); use of high-persistence screens results in a panoramic presentation which is, in effect, a map of the area being explored (used mainly in aircraft). Radar principles also are used in fire-control systems of naval vessels, coast artillery installations, and anti-aircraft batteries. Also used in missile guidance systems.

radar trace. The pattern produced on the cathode-ray screen of a radar unit.

radial lead. A lead coming from the side of a component, rather than axially from the end.

radian. An angle of 57°17′44.80625″. The angle for which the arc length is equal to the radius. There are 2π radians in one revolution (360°).

radiance. The apparent radiation from a surface. Same as luminance except that it applies to all kinds of radiation instead of just light flux. Unit of measurement is the watt per steradian per sq. meter.

radians per second. Unit of angular velocity.

radiant energy. Energy in the form of electromagnetic radiation such as radio waves, heat waves, light waves, ultra-violet rays or X-rays.

radiant flux. The rate of radiant energy transmission usually expressed in watts.

radiate. To send out radiant energy into space.

radiating curtain. An array of dipoles in a vertical plane, positioned to reinforce each other.

radiating guide. An ultra- to super-high frequency waveguide designed to radiate energy into free space.

radiation. Electromagnetic energy traveling outward into space such as radio waves, infrared rays, X-rays, etc.

radiation field. The electromagnetic field radiated by a transmitting antenna.

radiation pattern. A diagram indicating the intensity of the radiation field of a transmitting antenna as a function of plane or solid angles. In a receiving antenna, it is a diagram indicating the response of the antenna to a unit field intensity signal arriving from different directions.

radiation resistance. The total radiated power of an antenna divided by the square of the effective antenna current measured at the point where power is supplied to the antenna.

radio. General term denoting radio wave transmission and reception, exclusive of facsimile, television, radar, and other specialized systems employing radio principles but commonly known by other terms.

radio acoustics. The production, transmission and reproduction of sounds carried by radiotelephony.

radio beacon. A stationary radio transmitter which sends out special identifying signals continuously. Radio receivers on ships at sea and on aircraft in flight can tune to a radio beacon to determine their direction and position with respect to the beacon location.

radio broadcasting. A one-way transmission of voice and music to anyone within receiving range of the station.

radio channel. A band of frequencies having sufficient width for radio communication and broadcasting purposes. The width of a channel depends on the type of transmission and the tolerance for the frequency of emission. Standard television channels in the U.S. are 6 megacycles wide and standard radio broadcast channels are 10 kilocycles wide.

radio compass. A radio direction finder with a zero center meter, used chiefly in marine and aircraft radio stations for navigational purposes.

radio control. The control of stationary or moving equipment (usually unmanned), such as aircraft, ships, missiles, and various types of models by means of radio signals transmitted to the device to be controlled.

radio circuit. 1. A radio system for carrying out one communication at a time in either direction between two points. 2. An arrangement of parts and connecting wires for radio purposes.

radio communication. The transmission by means of radio of writing, signs, signals, pictures and sounds of all kinds.

radio converter. A unit for adapting a receiver for use at the high or ultra-high frequency bands.

radio direction finder. A receiver and rotatable loop antenna used to determine the direction from which radio waves are being received. A complete DF (Direction Finding) System combines bearings from several, scattered DF receivers (or transmitters) to obtain exact position and course of aircraft, ships, etc.

radio fadeout. See fadeout.

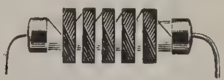
radio field intensity. The effective value of the electric or magnetic field intensity at a point due to the passage of radio waves of a specified frequency. Usually expressed in microvolts or millivolts per meter and measured in the direction of maximum field intensity.

radio fix. 1. Determination of the position of the source of radio signals by obtaining cross bearings on the transmitter with two or more radio direction finders in different locations. 2. Determination of the position of a vessel or aircraft equipped with direction-finding equipment by obtaining radio bearings on two or more transmitting stations of known location.

radio frequency. Specifically, that part of the general frequency spectrum between audio sound and infrared light (about 10 kc to 10,000,000 mc). Generally, an alternating current frequency whose electromagnetic field can be radiated over great distances.

radio-frequency alternator. A mechanical-electrical generator furnishing high power at radio frequencies below 100 kilocycles, formerly used for radio transmitters. Alexanderson alternator.

radio frequency amplifier. A vacuum tube amplifier stage to provide amplification at radio frequencies for transmitting or receiving. In a TRF (tuned radio frequency) receiver, all stages ahead of the detector are RF amplifier stages. In a superheterodyne receiver, the amplifier stage sometimes used ahead of the first detector is an RF amplifier stage.



Radio-Frequency Choke

radio-frequency choke. An air or pulverized iron core inductor having a high impedance at radio frequencies, and used to block the flow of radio-frequency current while permitting lower frequencies or direct current to pass.

radio-frequency oscillator. An oscillator that generates alternating current at radio frequencies.

radio-frequency resistance. Effective resistance. The total resistance offered by a resistor in an alternating-current circuit. The value differs from that offered to DC in that it is increased by eddy current, dielectric and hysteresis losses and by skin effect.

Radio-Frequency Signal Generator

radio-frequency signal generator. A test instrument used to generate radio-frequency voltages required for alignment and servicing of radio and electronic equipment. Also called a service oscillator.

radio-frequency stage. A stage of amplification, usually consisting of a vacuum tube and one or more tuned circuits which can be resonated to the received signal (tuned radio-frequency stage). Sometimes employs high plate and grid impedances, and serves as a stage of untuned amplification (untuned radio-frequency stage).

radio-frequency transformer. A transformer for radio-frequency currents having either an air core or some form of pulverized iron core.

radio interference. Undesired disturbance of radio reception.

radio link. The transmission of a sound or television program between specific stations by means of radio rather than over telephone lines or special transmission lines.

radio metal locator. A radio instrument which indicates the presence of metal within its operating range by a change in meter reading or a change in a tone signal heard in headphones. Used for determining positions of buried pipe lines, buried metal objects, metal objects concealed in the clothes of prisoners, metal objects imbedded in logs about to be sawed, deposits of metallic minerals, etc.

radio meteorograph. A combination meteorograph and radio transmitter carried aloft by an unmanned gas-filled rubber balloon and so designed that it will transmit back to earth radio signals which can be interpreted in terms of the pressure, temperature and humidity at regular intervals during the ascent of the balloon into the stratosphere. When the balloon bursts, the instrument is lowered to earth by a parachute.

radio navigation. Use of radio signals for course-plotting and determination.

radio photogram. A photograph transmitted by radio.

radio photography. Transmission of photographs by radio.

radio prospecting. Use of radio equipment to locate mineral or oil deposits.

radio range. A radio-range beacon.

radio-range beacon. A radio beacon that transmits directive waves by means of which deviations from the course are instantly made known to the aircraft operator.

radio receiver. An instrument which amplifies radio frequency signals, separates the intelligence signal from the RF carrier, amplifies the intelligence signal additionally in most cases, then converts the intelligence signal back into the original sound waves.

radiosonde. A method of transmitting meteorological instrument readings from a weather balloon or other carrier to recording instruments on the ground.

radio spectrum. The entire range of useful radio waves as classified into seven bands by the Federal Communications Commission, as follows:

Designation	*Abbr.*	*Frequency*	*Wavelength*
very low frequency	vlf	10-30 kc	30,000-10,000 meters
low frequency	lf	30-300 kc	10,000- 1,000 meters
medium frequency	mf	300-3,000 kc	1,000-100 meters
high frequency	hf	3-30 mc	100-10 meters
very high frequency	vhf	30-300 mc	10-1 meter
ultrahigh frequency	uhf	300-3,000 mc	100-10 centimeters
superhigh frequency	shf	3,000-30,000 mc	10-1 centimeter

radio-station interference. Selective interference caused by the radio waves of a station or stations other than that from which reception is desired.

radio-telegraph. Pertaining to telegraphy over radio channels.

radio-telegraph transmitter. A radio transmitter for transmission of code signals (type A1 and B emissions).

radio-telegraphy. Telegraphy employing the International Morse code and transmitted by means of radio waves.

radio-telephone. The complete equipment required at one station for radiotelephony.

radio-telephone transmitter. A radio transmitter designed for transmission of audio frequency modulation, such as voice and music.

radio-telephony. Two-way voice communication (telephony) carried on by means of radio waves.

radio-thermy. Therapeutic treatment of sub-cutaneous tissue by high frequency radio energy. Diathermy.

radio transmission. Radiation. The conveyance of intelligence by radio waves.

radio transmitter. A radio-frequency power source used for radio transmission.

radio wave. A combination of electric and magnetic fields varying at a radio frequency, and capable of traveling through space at the speed of light. It is produced by feeding the output of a radio transmitter to the transmitting antenna. May carry modulation. Originally called a Hertzian wave.

radium. A highly radioactive metallic element.

radius. The shortest distance from the center of a circle or arc, to a point on the circumference.

radome. General term for radar turrets which enclose antenna assemblies.

random noise. A general term for irregular disturbances of an electrical nature. It is non-uniform in amplitude, phase and frequency.

random winding. A haphazardly wound coil.

range. 1. Extent of coverage or effectiveness. 2. Measure of distance.

raster. A television term referring to an illuminated picture tube screen obtained without modulation.

rated output. The power, voltage or current which a device will provide when operated under normal conditions.

ratio detector. An FM detector circuit that utilizes the ratio of two developed IF voltages whose relative amplitudes are a function of frequency, rather than the difference of those potentials as in the case of the discriminator circuit.

RC, RC circuit. Designation for any resistor-capacitor circuit.

RC constant. The time constant of a resistor-capacitor circuit, equal in seconds to the value of the resistance multiplied by the value of the capacitance.

RC coupling. Resistor-capacitor coupling between two circuits.

reactance. Opposition offered to the flow of alternating current by inductance or capacitance of a component or circuit. An inductor having an inductance L (henries) has an inductive reactance ωL (angular frequency times inductance) This is in ohms. The value increases with frequency. A capacitor having a capacitance C (farads) has a capacitive reactance $1/\omega C$ (reciprocal of angular frequency times capacitance). This is in ohms. The value decreases with increasing frequency. Reactance is designated by X. Its reciprocal is susceptance (B).

reactance factor. The ratio of the AC resistance of a conductor to its ohmic resistance.

reactance load. The reactance of a capacitive or an inductive load.

reactance modulator. A modulator stage used in frequency-modulation transmitters and in panoramic adapters to accomplish frequency modulation by operating a vacuum tube in such a way that it acts as a reactance that varies in accordance with the intelligence modulation, causing the frequency of the oscillator stage to vary accordingly. The same general principles have been used in automatic frequency-control circuits.

reactance tube. An electronic tube, usually a standard triode, whose plate circuit reactance (which varies with grid voltage changes) causes a change in the resonant frequency of an oscillator to which it is connected. Used as a reactance modulator. In color TV, a tube which controls the frequency of the receiver subcarrier oscillator in accordance with a DC correction voltage supplied from a phase detector. Also used in black and white TV receivers to control the frequency of the horizontal oscillator.

reaction. Another name for regeneration.

reactivation. A method of boosting the electron emission of weak tubes, usually television picture tubes. Higher than normal voltage is applied to the filament of the tube to bring a fresh layer of thorium atoms to the surface, thereby improving the emission rate.

reactive. Pertaining to either inductive or capacitive reactance.

reactor. A device that introduces reactance (either inductive or capacitive) into a circuit. A coil or capacitor.

receiver. In general, equipment for reception of radio waves, light waves, etc., and conversion of these waves to usable form, such as audible sound, relay action, TV pictures.

receiver primaries. In a color TV receiver, colors of constant chromaticity and variable luminance. The primary colors used in the *NTSC* system are red, green and blue. These three colors are mixed in various proportions to produce all other colors.

receiving antenna. A conductor or system of conductors used for the reception of radio signals.

receptacle. A socket or outlet into which a plug can be pushed or screwed for the purpose of making electrical connection.

record compensator. An electronic circuit that compensates for the characteristics of phonograph records. Since in the recording of modern records the amplitude of treble frequencies is accentuated, a record compensator is required during playback to restore bass and treble to normal levels. The frequencies at which bass attenuation and treble accentuation begin vary from manufacturer to manufacturer, and even tend to vary between records of the same manufacturer. For this reason, record compensators employ a selector switch to permit selection of the playback curve that gives most authentic response.

record equalizer. See record compensator.

recorder. An instrument that makes a graphic record of the manner in which the value of a quantity (voltage, current, power, temperature), varies with time. Also called a recording instrument. Mechanical sound recorders cut or inscribe a groove in wax or other material. Facsimile recorders produce a graphic record on paper. A code recorder records code messages as punched holes or inked lines on paper tape.

recording. 1. In facsimile, the process of registering the received signal on the record sheet. 2. The mechanical process of producing a permanent physical record of sounds or other varying quantities. 3. A phonograph record.

recording blank. A recording disc.

recording disc. An unrecorded or blank disc used for sound recording purposes. Also called a recording blank. The recorded disc is called an instantaneous recording.

recording head. Ring-shaped electro-magnet in tape recorders. The recording tape moves along the head, which, when energized, magnetizes the oxide coating on the tape in accordance with the frequency of the sounds being recorded. Also, a device used in cutting the grooves when making disc recordings; see cutting head.

recording level. Designation of the db or VU output of an audio amplifier used for recording.

record player. A motor-driven turntable and a crystal or magnetic phono pick-up used for converting a phonograph record into audio frequency signals. These signals must be fed into the audio section of a radio receiver or into a separate audio amplifier for additional amplification before they can be reproduced as sound waves by a loudspeaker. When the amplifier and loudspeaker are built into the same cabinet with the record player, the combination is generally called a phonograph.

rectification. The process of converting alternating current into a unidirectional current by removing or inverting that part of the wave lying on one side of the zero amplitude axis.

rectifier. A unilateral component, usually a vacuum tube or other unidirectional current-limiting device, that accomplishes the process of rectification of alternating current. It may be a vacuum tube, gas tube, crystal, vibrator, or barrier-layer cell.

rectifier instrument. A direct-current meter equipped with a rectifier or group of rectifiers, such as in a bridge, for measuring alternating currents or voltages.

rectifier stack. A single-unit assembly or stack of individual rectifiers.

rectifying detector. A vacuum tube or crystal detector that operates by rectification during the process of detection or demodulation.

rectigon. A hot-cathode, gas-filled rectifier tube most frequently employed for battery charging. Similar to a tungar bulb.

red gun. The electron gun in a three-gun color picture TV tube. Its beam strikes the red-emitting phosphor dots of the screen mosaic.

reed frequency meter. A frequency measuring instrument employing a series of metal reeds of varying length, which vibrate visibly in response to definite frequencies.

reference dipole. A half-wave straight dipole tuned and matched for a given frequency and used as a unit of comparison in antenna measurement work.

reference level. The starting or zero point from which a scale is laid out or from which measurements are made. For example, the common reference point (level) in decibels (db) is 0.006 watt; in volume units (VU's) it is 0.001 watt.

reference phase. In color TV, the phase of burst signal voltage in the receiver, and the master oscillator voltage in the transmitter.

reference signal. See color burst.

reference white. The standard white color used as a reference comparison to all other colors. The NTSC standard white approximates direct sun or clear sky light with a color temperature of 6500° K. Primary colors are measured in units so that one unit of each primary when combined with one unit of each of the other primaries will produce the reference white.

reflected impedance. The impedance value that appears to exist across the primary of a transformer or other component when an impedance load is connected across the secondary.

reflected wave. The sky radio wave, reflected back to the earth from an ionosphere layer.

reflecting curtain. A vertical array of many half-wave reflecting antenna elements generally used behind a radiating curtain of a number of dipoles, to form a high-gain antenna array.

reflecting galvanometer. A galvanometer in which a small mirror attached to the moving element reflects a beam of light onto a scale thus magnifying the movement of the element.

reflection. The change in direction of waves after impinging on a surface. Examples: reflection of light, sound waves, radio waves.

reflection altimeter. An aircraft altimeter depending on the reflection of radio waves from the earth for the determination of altitude.

reflection law. The angle of reflection is equal to the angle of incidence; both measured from the normal to the surface.

reflective optics. A system of mirrors and lenses used in projection television. Also called Schmidt optics.

reflector. 1. In a directional antenna system, the rear portion or element usually not connected to the remainder of the antenna, and used to reflect radio waves back to the main elements. 2. A polished reflecting surface used to change the direction of radiant energy or sound waves, or concentrate them in a desired direction.

reflector voltage. The voltage between the reflector electrode and the cathode in a reflex klystron.

reflex circuit. A circuit in which the signal is amplified, both before and after detection, in the same amplifier tube or tubes.

reflex coefficients. Descriptions of tube behavior insofar as grid current flows and is affected by grid and plate voltages and plate current. Reflex amplification factor is the change in grid voltage produced by a change in plate voltage. Reflex transconductance is the change in grid current caused by a change in plate voltage. Grid resistance is the change in grid voltage resulting from a change in grid current.

reflex klystron. A velocity-modulation klystron tube serving as a feedback oscillator.

refracted wave. The wave that is bent (refracted) as it travels into a second medium of propagation, as from the atmosphere into an ionized layer of the stratosphere.

refraction. The bending of a ray of light, heat, sound, or a radio wave passing obliquely from one medium into another in which the velocity of propagation is different from the first medium. Bending is toward that medium in which the velocity is less.

regeneration. A method of securing increased output from an RF amplifier by feeding part of the output back to the amplifier input in such a way that reinforcement of the input signal is obtained. With this arrangement, a signal may pass through the same amplifier over and over again, with a resultant increase in amplitude. Causes oscillation when carried to extremes.

regeneration control. A rheostat, potentiometer, or variable capacitor which is used in a regenerative receiver to control the amount of signal which is fed back from output to input in the regenerative detector stage.

regenerative amplification. Amplification that provides increased gain and selectivity by feedback.

regenerative detector. A vacuum-tube detector circuit in which radio-frequency feedback is employed to produce regeneration.

regenerative feedback. Regeneration.

regenerative receiver. A radio receiver which employs controlled regeneration to increase the amplification provided by a vacuum tube stage (usually the detector stage).

register. In color television, the condition in which all three color images are properly superimposed on each other.

regulated power supply. A power supply containing a regulator device for maintaining constant voltage or constant current under changing load conditions.

regulation. 1. Holding some condition, like speed, temperature, voltage, current, power or position, constant. 2. Voltage change due to a load divided by the open circuit voltage.

regulator. A device that accomplishes regulation within desired limits. Example: a current or voltage-regulated power supply.

Reinartz crystal oscillator. A crystal-controlled vacuum-tube oscillator designed by John Reinartz and named after him. It features a resonant circuit connected between cathode and ground, tuned to half the crystal frequency.

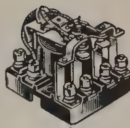
reinserter. See clamper.

reinsertion of carrier. The combining of an incoming suppressed-carrier type signal with a locally generated carrier signal in the receiver.

rejector circuit. A parallel resonant circuit which suppresses the frequency to which it is tuned.

relaxation inverter. A relaxation oscillator circuit that converts direct-current power to alternating-current power.

relaxation oscillator. 1. Generally, an oscillator having a decidedly non-sinusoidal output, resulting from abrupt transitions from one unstable state to another. 2. An oscillator in which the frequency is controlled by the charge or discharge of an inductor or capacitor through a resistor. 3. A multi-vibrator oscillator circuit employing two tubes (or a double-section tube) with resistance-capacitance coupling between the tubes to feed the output back and forth between them. Used in television circuits to generate sweep voltages for cathode-ray tubes.



Relay

relay. An electromagnetic switch employing an armature to open or close contactors. A small current through the coil actuating the armature thus controls a heavy duty circuit at the contactors.

relay contacts. Contacts attached to or activated by the movement of the armature of a relay.

relay magnet. A coil and iron core forming the electromagnet that attracts the armature of a relay when energized.

relay rack. A standard vertical steel frame that accommodates standard-width (19″) panels of various heights. On these panels is mounted electronic equipment. Rack sides usually are drilled and threaded for 10–32 machine screws; distances between hole centers always are multiples of ½″ and ⅝″, to accommodate standard-notched panels. Originally designed for panels containing banks of relays in telephone centrals; hence the name, relay rack.

relay rack cabinet. A fully enclosed steel cabinet that accommodates standard-width (19″) rack panels. Generally used for equipment requiring shielding (such as radio-frequency components) or dust protection.

relay station. Also known as relay transmitter, or repeater station. Relay stations are radio transmitters that rebroadcast sound or television programs the instant they are received, so that the program can be passed on to another station outside the range of the originating transmitter. TV networks employ relay stations in this manner.

reluctance. A measure of the force exerted against magnetic flux which permeates a material. Equal to the magnetomotive force divided by the magnetic flux

remanence. The magnetic induction remaining in a magnetic circuit after removal of applied magnetomotive force.

remote control. The operation of a device from a distance, either electrically or by radio waves.

remote cutoff tube. Supercontrol tube. Variable mu tube. A tetrode or pentode in which the spacing of the control grid wires is wider at the center than at the ends. Thus, the amplification of the tube does not vary in direct proportion to the bias, and some plate current flows regardless of the negative bias on the grid. Used in RF amplifiers.

repeat point. A second position of a superheterodyne tuning dial at which reception of a given station occurs and at which the local oscillator frequency is above or below the incoming signal by the IF value. Results from misalignment, or insufficient IF selectivity.

repulsion. A force tending to separate objects or particles having like electrical charges or magnetic polarities.

re-radiation. Radiation from a radio receiver caused by poor isolation between antenna circuit and means of oscillation within the receiver. It causes undesirable interference in other receivers.

re-recording. The making of a recorded copy of a phonograph record, magnetic tape or film sound track.

residual charge. The charge remaining on the plates of a capacitor after an initial discharge.

residual gases. The small amount of gas remaining in an evacuated container or tube after exhaustion.

residual magnetic induction. The magnetic induction remaining in a ferro-magnetic object after the magnetizing force is removed. Also called residual magnetism.

residual magnetism. Residual magnetic induction.

resistance. The non-reactive opposition which a device or material offers to the flow of direct or alternating current. The opposition results in production of heat in the material carrying the current. Resistance is measured in ohms, and is usually designated by the letter R.

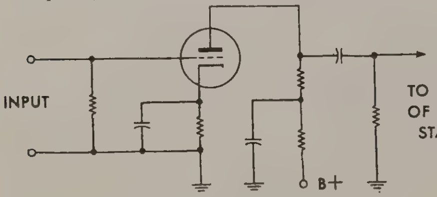
resistance box. See decade resistance box.

resistance bridge. See Wheatstone bridge.

resistance-capacitance-coupled amplifier. A vacuum tube amplifier, the various stages of which employ resistors for the plate load, and in the grid circuit; coupling between them is by capacitors.

resistance-capacitance coupling. The coupling of two vacuum-tube stages or circuits by means of a resistor and capacitor.

resistance-coupled amplifier. A vacuum-tube amplifier in which the various stages are coupled solely by resistances between output and input. A direct-coupled amplifier. Such systems are useful down to zero frequency. Often, this term is used for a resistance-capacitance-coupled amplifier, which is a more common type.



Resistance-Coupled Amplifier

resistance coupling. Method of coupling a signal from the plate of an amplifier stage to the grid of the following stage. The resistor is placed in series with the plate lead and the signal is fed from the plate to the grid by means of a coupling capacitor. Commonly called resistance-capacitance or RC coupling.

resistance drop. Voltage drop occurring between two points due to the flow of current through a resistance connected between those points. Known as an IR drop.

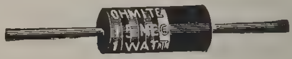
resistance loss. Power loss due to current flowing through a resistance.

resistance pad. A system of resistors used to (a) reduce signal strength; (b) change impedance; or (c) isolate circuits.

resistance standard. A wire or ribbon resistor, well constructed and carefully mounted or housed. It is usually supplied with a certificate of calibration after being adjusted to a specific value. The resistor is designed to resist variations in temperature and retains its calibrated value over long periods of time.

resistance wire. Wire made from an alloy having high resistivity.

resistivity. The specific resistance of a unit specimen of a material. Expressed either as ohm-centimeters or ohms per circular mil foot. The resistive property of a material is thus expressed as the number of ohms in a piece one square centimeter in cross section and one centimeter long, or a piece one circular mil in cross section and one foot long. Examples: The resistivity of copper is 1.72 microohm centimeters. The resistivity of nichrome is 610 ohms per circular mil foot.



Resistor

resistor. A radio part which offers resistance to the flow of electric current. Its electrical size is specified in ohms or megohms (one megohm equals 1,000,000 ohms). A resistor also has a power-handling rating in watts, indicating the amount of power which can safely be dissipated as heat by the resistor.

resistor core. The support on which a resistor element is wound.

resistor element. That part of a resistor which possesses the resistance property.

resolution. Degree of reproduction of the detail of a televised scene.

resolution chart. A pattern of black and white lines and picture elements used to check resolution of television equipment.

resonance. 1. When equivalent (combined) reactance is zero in a circuit containing inductance L and capacitance C. If L and C are in series, circuit current is a maximum at resonance. If L and C are in parallel, external current supplied to circuit is a minimum at resonance and voltage nearly maximum. 2. At resonance, small amplitude of the periodic agency that is maintaining oscillation or vibration in a system produces large amplitude of oscillation or vibration. 3. Types of resonance: amplitude, period, phase.

resonance bridge. See impedance bridge.

resonance curve. A graphic representation showing the response of a resonant circuit to various frequencies within its operating range. Maximum current in a series circuit and maximum impedance in a parallel circuit occur at resonance.

resonance indicator. A device, such as a meter or neon lamp, that provides visual means of showing resonance in a circuit.

resonant cavity (resonating cavity). A short piece of wave guide of adjustable length, and terminated at either or both ends with a metal piston, an iris diaphragm, or some other wave-reflecting device. It can be used as a filter, a coupler between guides of different diameters and as an impedance network corresponding to those used in radio circuits.

resonant circuit. An oscillator circuit capable of being brought into resonance.

resonant frequency. The frequency which produces resonance in a coil-capacitor tuning circuit. In a series resonant circuit, the largest current flow occurs at the resonant frequency. In a parallel resonant circuit, the largest voltage is developed across the circuit at the resonant frequency. The frequency at which a speaker voice coil, spider and cone vibrate as a single unit.

resonant frequency of a tube. The theoretical highest frequency at which a tube could oscillate, corresponding to complete absence of external capacitance and inductance. The output at this frequency usually is not large enough for practical application.

resonant line. A transmission line that is resonant at the frequency it is handling.

resonant-line oscillator. A self-excited ultrahigh-frequency oscillator employing parallel rods in grid and plate circuits as resonant lines.

resonant transmission line. A resonant line.

resonate. To bring to resonance, as by tuning.

resonator. A circuit that responds in accordance to oscillations produced in another circuit.

response. Frequency range, or response, within specific limitations of speakers, amplifiers, cartridges, sound systems, etc.

resting frequency. The assigned carrier frequency of a frequency-modulation station. Also called center frequency. It is the frequency from which deviation above and below takes place during modulation.

restorer. In TV, a circuit generally using a diode tube which automatically supplies bias voltage to the picture tube grid. This voltage is always proportional to the strength of the incoming signal. In color TV, three separate restorers are used for each channel (red, green and blue), so that the overall luminance and color proportion will produce the proper full-color picture.

retarding-field oscillator. A special type oscillator employing a triode tube, and capable of generating frequencies up to about 5,000 mc.

retentivity. A measure of the ability of an iron alloy material to hold its magnetism.

RETMA. Abbreviation for Radio-Electronics-Television Manufacturers' Association. Now changed to EIA (Electronics Industries Association).

RETMA color code. One of the systems of color markings developed by the Radio-Electronics-Television Manufacturers' Association (see EIA) for identifying electrical values and terminal connections of radio parts. RETMA color coding is used on resistors, fixed capacitors and transformer windings.

return trace. A line on the cathode-ray screen formed by the beam when it moves back to its starting position.

retrace. A television term meaning the return trace of the spot in a picture tube after sweeping across the screen.

retrace ghost. An image produced on a television screen during the retrace period. It may be due to improper blanking of the television camera tube at the transmitter.

return wire. A common wire, a ground wire, or the negative wire in a direct-current circuit.

reverberation. A succession of echos caused by reflections of sound within an enclosed space.

reverberation time. The time in seconds required for the sound energy in a reverberating enclosure to reduce to one-millionth of its initial value after the source is silenced.

reversing switch. A two-position switch that may be set at one position to send current through a circuit in a desired direction, or set to its other position to reverse the direction of current flow. Reversing switches are used frequently on volt-ohm-milliameters and voltmeters to simplify the use of test leads. Also, a type of switch used on stereophonic preamplifiers and amplifiers to permit reversing the left and right channels of a stereo system.

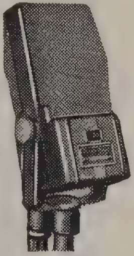
RF. Abbreviation for radio frequency.

RFC. Designation used on diagrams to identify a radio-frequency choke coil.

rheostat. A resistor whose value may be changed by means of a control knob. A potentiometer used with one fixed and one movable terminal, or, in the larger sizes, having only these two terminals.

rhombic antenna. A directional antenna array consisting of four long conductors laid out like an equal-sided parallelogram (rhombus). Also called diamond antenna.

RIAA curve. Abbreviation for Recording Industry Association of America recording curve. It is the most frequently used standard for bass de-emphasis and treble emphasis employed in the recording of microgroove records.



Ribbon Microphone

ribbon microphone. A microphone with a moving conductor consisting of a single flexible ribbon of thin corrugated metal (usually aluminum foil), mounted between the poles of a permanent magnet. Often called velocity microphone.

RID. Abbreviation for Radio Intelligence Division. An agency of the FCC, set up to detect unlicensed radio stations in the U.S. and its possessions. The RID also monitors the transmissions of foreign stations.

rig. A complete system of components. Thus, an amateur rig is the complete amateur station consisting of receiver, transmitter, and all of the accessories used with this equipment.

right-hand rule. A rule for determining direction of magnetic lines of force and direction of current for a conductor in the armature of a generator or motor. Also known as Fleming's rule. When the thumb, first and second fingers of the right hand are extended at right angles to one another, if the first finger points in the direction of magnetic flux and the thumb in the direction the conductor is moved, then the middle finger points in the direction that induced current flows in the conductor. For current-carrying wires, if the fingers of the right hand are placed around the wire in such a way that the thumb points in the direction of the *current* flow, the fingers will be pointing in the direction of the magnetic field. (NOTE: Both these rules are based on *conventional current* flow, not electron flow.)

right-hand taper. A potentiometer or rheostat having higher resistance in the clockwise half of its rotational range than in its counterclockwise half, looking at the end having the shaft and knob.

rim drive. A method of driving the turntable of a phonograph or a recorder by means of a rubber-covered wheel attached to a shaft of a motor. The wheel contacts the inside rim of the turntable.

ringing. Damped oscillations occurring as the transient response of a resonant circuit to a shock excitation. A phenomenon employed in some types of pulse communications systems for converting a train of pulses to a sine wave for use in timing circuits. May also occur as an unwanted effect in improperly designed or badly adjusted circuits. Ringing in TV deflection circuits may give rise to multiple images on the television screen.

ripple. The alternating-current component present in the output of a direct-current generator, rectifier system or power supply.

ripple current. The alternating-current component of a pulsating uni-directional current.

ripple factor. Defined as the effective value of the alternating components of voltage (or current) divided by the direct or average values of the voltage (or current).

ripple filter. A low-pass filter designed to attenuate the alternating current components of a pulsating unidirectional current while passing the direct current from the rectifier or direct-current generator.

ripple frequency. The frequency of the ripple current.

ripple voltage. The alternating components of a unidirectional voltage.

rms. Abbreviation for root mean square.

Rochelle salt crystal. A crystal of sodium potassium tartrate, having a pronounced piezoelectric effect.

rocking. Back-and-forth rotation of the tuning control in a superheterodyne receiver while adjusting the oscillator padder near the low-frequency end of the tuning dial; done to secure more accurate alignment.

roentgen. The international unit of quantity of roentgen rays (X-rays). Produces ionization equivalent to 83 ergs of energy in dry air at 0°C. and sea level pressure.

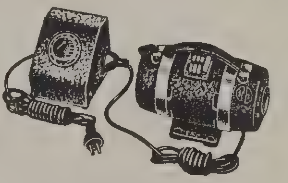
roll-off. A controlled attenuation (de-emphasis) of treble frequencies in a high-fidelity amplifier or preamplifier. Roll-off compensates for the emphasis of treble frequencies when phonograph records are made. Emphasis gives the recording a better signal-to-noise ratio, while roll-off helps restore correct tonal balance when the record is played.

root-mean-square. When referring to an alternating current value, the value that corresponds to the direct-current value that will produce the same heating effect. It is .707 of the peak AC value.

rosin-core solder. Solder made up in tubular form, with the inner space containing rosin flux for effective soldering.

rotary beam antenna. A highly directional antenna that can be rotated by hand or by motor to any desired position.

rotary converter. A rotating electric machine providing AC voltage from DC voltage input or vice versa. It has an armature with both commutator and slip rings.



Rotary Converter

rotary current. Any polyphase or multiple-cycle current. (Rarely used term.)

rotary gap. A rotary spark gap.

rotary spark gap. A type of spark gap utilizing a rotating disc having studs from which sparks leap to one or more stationary electrodes when high voltage potential is connected between disc and stationary electrodes. Extensively used in the early days of spark type radio transmitters.

rotary switch. A multi-position switch operated by rotating a control knob attached to its shaft. See gang switch and band switch.

rotary transformer. A rotary converter. Also a rotating device changing one dc voltage value to another dc value.

rotor. 1. A rotating member such as the armature of a motor or generator. 2. The rotating plates of a variable capacitor.

rotor plates. The rotating plates of a variable capacitor.

r_p. Symbol used to designate the plate resistance of a vacuum tube.

rpm. Abbreviation for revolutions per minute.

rps. Abbreviation for revolutions per second.

Ruhmkorff coil. A spark coil.

rumble. Noises of very low pitch which originate in the motor or drive mechanism of a record player, record changer or transcription turntable. These noises are transmitted via the stylus (needle) to the amplifier and are thus superimposed on the reproduced sound. Imperfections in machining and alignment are the cause of this effect.

rumble filter. A circuit used in high-fidelity amplifiers and preamplifiers to eliminate noises of a very low pitch originating in some turntables or record changers. These noises, called "rumble," are the result of imperfections in machining or alignment of the record mechanism.

R-Y signal. A red-minus-luminance or red-minus-Y color TV signal. See color difference signal.

S

S. Letter used on circuit diagrams to denote a transformer secondary winding.

sabin. A unit of equivalent absorption in acoustics, equal in its absorbing effect to 1 square foot of a completely absorbing surface, *i.e.*, one that does not reflect sound waves.

safety factor. The load, above the normal operating rating, to which a device can be subjected without failure.

sapphire. A pure variety of corundum used on the tip of a phonograph needle and on the stylus used in the cutting head of a sound recorder.

saturable reactor. A device consisting of a DC winding and an AC winding on the same core. The DC winding is used to vary the core saturation and thus controls the reactance and impedance to current in the AC winding.

saturation. 1. The condition existing in a tube when thermionic or photo-electric current is the maximum that can be obtained by increasing the anode voltage, or, in the thermionic case, the temperature of the cathode. See voltage saturation and temperature saturation. 2. The condition existing in a magnetic material when the flux density is the maximum that can be obtained by increasing the magnetomotive force. In color TV, freedom of a color from white. Vivid or strong colors are highly saturated while pastel shades are of low saturation.

saw-tooth generator. A neon or thyratron relaxation oscillator or a vacuum tube oscillator providing an alternating voltage characterized by a "saw-tooth" waveform.

saw-tooth voltage. A voltage that varies linearly at regular, but unequal, intervals between two values, the waveform pattern resembling the teeth of a saw. Used in television receivers to insure uniform rate of movement of the beam across and down the face of the picture tube.

scaling circuit. A counting circuit used to record the pulses from the Geiger tube or similar instrument in cases where the pulse frequency is too high for direct operating of an electromagnetic counter. The scaling circuit reduces the rate of operation by a factor or ratio. The circuit is some form of trigger circuit employing a number of thyratrons or vacuum tubes so arranged that the number of off and on tube combinations is large (often a power of two or ten). Each pulse sets up a new combination in sequence. When the program of combinations has been run through the output relay counts one.

scaling ratio. The number of input pulses corresponding to one output pulse. The reading on the output counter times this ratio gives the number of input pulses.

scanning. In television, a method of viewing or displaying a scene. The field of view is not covered simultaneously, but the tiny elements of the picture are passed over systematically, line by line, from top to bottom as in reading, but so rapidly as to appear instantaneous. In the iconoscope or image orthicon in the studio, an image of the scene falls on a mosaic of photo-sensitive elements. An electron beam scans the mosaic, producing voltages corresponding to the shades of black and white in the scene being televised. In the receiver, the reverse takes place, with the modulated electron beam scanning, synchronously, the fluorescent coating on the face of the kinescope (the screen).

scanning frequency. In television, 30 frames per second and 525 lines per frame.

scanning line. A single continuous narrow strip covered by one passage of the beam across the television or facsimile field.

scanning spot. The beam size; the area viewed at any one instant by a television camera.

scanning yoke. The specially shaped core that supports the electro-magnetic deflecting coils which provide controlled deflection of the electron beam in a cathode ray tube.

scatter effect. In short-wave transmission of radio waves, the scattering of the received energy by irregularities in the earth's surface.

scattering. The tendency of an electron stream to expand or diverge due to the repelling influence exerted on every electron in the stream by every other electron.

scc wire. Abbreviation for single-cotton-covered wire.

sce wire. Abbreviation for single-cotton covering over enamel insulation on a wire.

schematic diagram. A diagram which shows electrical connections of a radio, television or other electronic device by means of symbols which are used to represent the parts.

scintillation counter. A device used for the detection of radioactivity. The basic scintillation counter consists of an optical system and a luminescent screen. This type of unit, sometimes called an alpha counter, is sensitive to alpha particles which are indicated by minute flashes of light on the screen. The flashes are detected by a photomultiplier. Other types of more complex scintillation counters have extremely high sensitivity and employ a meter, headphones, or both, to indicate the presence of gamma rays, or in some cases, alpha, beta and gamma rays. Scintillation counters are widely used in prospecting for radioactive ores.

scrambled speech. Radio-telephone speech that has been made unintelligible by inverting the frequencies for secret transmission of transoceanic radio-telephone calls and other purposes. One way in which inversion is accomplished at the transmitter is by suppressing the carrier and combining a sideband with a higher frequency carrier. Re-inversion is brought about at the receiver. Also called inverted speech.

scratch filter. A low-pass filter circuit inserted in the circuit of a phonograph pickup to suppress needle-scratch noises. It suppresses the higher audio frequencies as well.

screen. 1. A metal partition or shield to isolate a device or apparatus from external magnetic or electric fields. 2. The screen grid electrode of an electron tube. 3. The coated surface on the inside of the large end of a cathode-ray tube.

screen grid. A grid placed between the control grid and plate elements of a pentode or surrounding the plate of a tetrode. The purpose: to decrease grid-plate capacitance.

screen-grid modulation. A type of amplitude modulation most frequently used with beam tetrode RF (radio frequency) amplifiers. The modulating voltage is superimposed on the DC screen-grid voltage of the RF amplifier. Efficiency and plate current of the RF amplifier vary proportionately with the amplitude of the modulating voltage.

screen-grid tube. A vacuum tube having a screen grid.

screen-grid voltage. The direct voltage applied between the screen grid and the cathode in a vacuum tube. Usually intermediate between cathode and plate potentials.

S-curve. An oscilloscope presentation of output voltages as a function of frequency deviation in an FM demodulator. The curve resembles the letter S. The display is used to align the FM demodulator transformer.

sealing compound. A type of wax or pitch compound used in dry batteries, capacitor blocks, transformers or circuit units, to keep out air and moisture.

sealing off. Final closure of the glass or metal envelope of a vacuum tube or lamp after evacuation.

search coil. A tiny exploring coil of wire used with a ballistic galvanometer or fluxmeter to measure flux density in a magnetic field.

sec. 1. Abbreviation for second. 2. Abbreviation for the secondary winding of a transformer.

second anode. The electrode in a cathode-ray tube that is maintained at a constant positive potential and is used to accelerate the beam.

secondary. One or more transformer windings which receive energy by electromagnetic induction from the primary.

secondary cell. A d.c. voltage source which is capable of storing electrical energy. When exhausted, it can be recharged by sending direct current through it in the reverse direction. Each cell of an ordinary storage battery is a secondary cell.

secondary electron. An electron emitted as a result of bombardment of a material with electrons.

secondary emission. Emission of electrons from a cold electrode when it is hit or bombarded by high-speed electrons.

secondary voltage. The voltage across the secondary winding of a transformer.

secondary winding. Any of the output windings in a transformer.

second detector. In a superheterodyne receiver, the stage that separates the intelligence signal from the intermediate-frequency carrier signal.

selective. The characteristic of responding to a desired frequency to a greater degree than to other frequencies.

selective fading. Rapid fluctuations in the strength of radio signals on all frequencies within a particular band. This type of fading is often encountered when receiving radiotelephone signals at frequencies below 5 mc. When selective fading occurs, it often results in distortion, since it can cause independent fading of the carrier frequency and the sideband frequencies produced by modulation.

selective interference. Radio interference in a narrow band of frequencies.

selective reflection. Reflection of waves of only a certain group of frequencies.

selectivity. The characteristic which determines the ability of a radio receiver to reject undesired and untuned signals. Also called selectance.

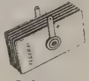
selectivity control. The device or circuit that changes the selectivity response of a radio receiver.

selector. A device, mechanical, electronic or electrical, for making connection to a number of circuits at will.

selector switch. See selector, above.

selenium cell. A photocell using selenium as a photo-conductive element. The resistivity of selenium decreases when the material is exposed to light.

selenium rectifier. A dry-disc rectifier made of a crystalline selenium layer between two electrodes. A chemical barrier action between the selenium and one electrode produces a uni-directional current flow when AC voltage is applied.



Selenium Rectifier

self-bias. Referring to a vacuum tube stage which produces its own grid bias voltage. Plate current flowing through a resistor in series with the cathode lead produces across this resistor the voltage drop used for grid bias purposes. Also called automatic C bias.

self-capacitance. The capacitor effects between adjacent turns of a closely wound coil.

self-cleaning contacts. Contacts designed to close with a rubbing motion that keeps them clean.

self-excitation. Supplying of field current to a generator from its own armature.

self-excited oscillator. A vacuum-tube oscillator that operates without external excitation and solely by the direct voltages applied to the electrodes.

self-healing capacitor. A capacitor that repairs itself after dielectric breakdown. Usually an oil-filled unit.

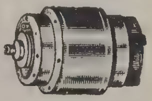
self-inductance. That property of a coil which opposes by a counter emf any change in current flow.

self-quenched detector. A super-regenerative detector in which the time constant of the grid leak and grid capacitor is sufficient to cause intermittent oscillation above audio frequencies, stopping normal regeneration each time before it becomes a squealing condition.

selsyn. A General Electric Company trade name, derived from self-synchronous. A transformer having a polyphase primary winding and a single phase secondary winding which can be rotated. The voltage induced in the secondary may be controlled in phase by turning the secondary coil.

selsyn generator. One name for the transmitter of a synchro unit. Its rotor is geared to or linked with mechanical equipment.

selsyn motor. A specially designed synchronous motor whose rotor will always assume exactly the same position as the rotor of a synchro-generator to which it is electrically connected.



Selsyn Motor

selsyn system. A system comprising at least one selsyn generator and one or more selsyn motors. Used in remote control and remote indication applications and for synchronizing motors where the power requirements are light.

semi-conductors. A class of solid materials characterized by comparatively high resistivities. Many of these are salts or oxides in which conduction is ionic. Another group, more important in communications, are semi-metallic elements or oxides in which conductivity is electronic, but of two types, depending on impurities present: (a) drift of electrons which are present in excess; (b) drift of "holes" by migration of electrons in cases where there is a deficiency of electrons. By special treatments, usually thermal, the resistivity, temperature coefficient of resistance or thermo-electric power may be varied over wide ranges. Semi-conductors are finding increasing use as rectifiers, detectors and amplifiers in transistors and varistors, thermistors and thermoelectric elements.

sending. Transmitting, as Morse code.

sense finder. Also called a sense antenna. That part of a direction finding radio system that determines from which of two opposite directions a received signal is arriving.

sensitive relay. A relay operating on small currents, generally less than 10 milliamperes.

sensitivity. 1. Characteristic of a radio or television receiver which determines the minimum input signal strength required for a given signal output value. 2. The displacement (generally measured in inches distance) of the luminous spot on the screen of a cathode-ray tube, per volt applied to deflecting plates or per ampere of current through a deflecting coil.

sensitivity control. A circuit that governs the gain of the radio-frequency amplifier stages of a radio receiver.

separator. A clipping circuit in television receivers that separates the control impulses from the video signal. Known as clipper or sync separator. Also, any insulating material used between the plates of battery cells to prevent their shorting. Glass or wood is frequently used.

sequential system. A system of color television transmission in which the colors are transmitted one after the other and which depends on eye retention and picture tube storage to combine them. Used for line, dot, and field sequential operation in which the respective elements are produced sequentially.

series. A way of arranging parts in a circuit by connecting them end to end to provide a single path for current flow.

series feed. In vacuum tube amplifiers and oscillators, the application of the plate voltage in series with the plate load circuit; the signal current being taken off through a capacitor or by inductive coupling.

series modulation. Modulation in which plate circuits of the modulating tube and the modulated amplifier tube are in series with the plate voltage supply.

series-parallel switch. A switch used to connect two components in series or parallel. Often accomplished with a DPDT switch.

series resonant circuit. A circuit in which an inductor and capacitor are connected in series, and have values such that the inductive reactance of the inductor will be equal to the capacitive reactance of the capacitor at the desired resonant frequency. At resonance, the current through a series resonant circuit is a maximum.

series winding. In a motor or generator, a field winding that carries the same current as the armature. *i.e.*, this winding is in series with the armature rather than in parallel with it. Series-wound motors are used in fractional horsepower AC-DC applications, such as fans and electric mixers. Their other chief use is in heavy-duty DC traction equipment, such as electric locomotives, because of their extremely high starting torque.

serrated pulse. In a television receiver system, a vertical or horizontal synchronizing pulse divided into a number of small pulses which act for the duration of half a line.

service area. The region around a radio broadcast station in which its signal strength is great enough to insure satisfactory reception at all times.

service band. A band of frequencies allocated by the FCC to a certain class of radio communication service as taxis, truck dispatching, etc.

service oscillator. A test instrument that generates various radio-frequency voltages for alignment and servicing of electronic equipment. Usually called radio-frequency signal generator.

servomechanism. A feedback control system which mechanically positions an object with respect to a signal which may be arbitrarily varied but is capable of supplying only negligible power.

set analyzer. A servicing instrument form easurement of voltages and currents in electronic equipment.

setscrew. A small machine screw to hold control knobs on shafts, to hold playing needles in phonograph pickups, to hold the cutting stylus in a cutting head, etc.

SG. The screen grid electrode of a vacuum tube.

shaded-pole motor. A single-phase induction motor having one or more auxiliary short-circuited windings acting on only a portion of the magnetic circuit. Generally the winding is a closed copper ring imbedded in the face of a pole. The shaded pole provides the required torque for starting purposes.

shading. In a television image, an undesirable reduction of background illumination, caused by secondary electrons returning to the mosaic. In the TV camera tube, the impact of the scanning beam knocks secondary electrons out of the mosaic. These secondary electrons may return to other globules and reduce the charge of the globule capacitance.

shading generator. A device used to reduce shading by generating waveforms which are 180 degrees out of phase with the shading signals produced by the return of secondary electrons to the mosaic.

shading ring. 1. A heavy copper ring set into the pole piece of the electro-magnet of a relay to permit its operation on alternating instead of direct current. 2. The copper ring that is set into part of a pole piece on small alternating-current motors to produce a slight rotation of the magnetic field during starting.

shading signal. In a television camera, the signal that serves to increase the gain of the amplifier in the camera during those intervals of time when the electron beam is on an area corresponding to a dark portion of the scene being televised.

shadow mask. In three-gun tricolor TV picture tube, thin sheet of metal mounted in back of phosphor dot plate, containing small holes through which each beam must pass. Holes limit beam direction so that it can strike intended color phosphor dot only.

shadow tuning indicator. A device that indicates when a radio receiver is accurately tuned to a station by the narrowing of a shadow thrown on a glass screen by the vane-shaped pointer of a meter movement.

shank. That part of a phonograph or recording needle which is clamped into position by a setscrew in the pickup or cutting head.

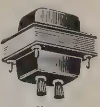
shaping network. An electrical network inserted in a circuit to improve its transmission properties, impedance properties, or both. Also called "corrective network," or equalizing network.

sharp cutoff. Term applied to a tube or the grid of a tube in which the control grid spirals are uniformly spaced. The result is that as grid voltage is made negative, plate current decreases steadily to cutoff. See remote cutoff tube.

sharp tuning. Responsive to a limited range of frequencies.

sheath. 1. The external conducting surface of a shielded transmission line. 2. The metal wall of a wave guide. 3. The cloud of positive ions that forms near the grid of a thyratron when the thyratron fires.

shell-type transformer. 1. A transformer whose external metal covering resembles a shell or a dish. In radio receivers usually only one shell is used on top of the chassis with the transformer windings uncovered for connection on the underside of the chassis. Such a transformer is called a half-shell transformer. 2. A power transformer in which the magnetic circuit has the form of theta (θ) with the coils wound on the center bar. Contrasted with the core type which has the form of an "O" with coils wound on both sides.



Shell-Type Transformer

shf. Abbreviation for super-high-frequency, designation for the band from 3,000 to 30,000 mc.

shield. A metal housing placed around a circuit component to prevent interaction of its electric and/or magnetic fields with those of near-by parts.

shielded line. A transmission line whose elements confine propagated radio waves to an essentially finite space inside a tubular conducting surface called the sheath, thus preventing the line from radiating radio waves.

shielded pair. A two-wire transmission line surrounded by a metallic sheath.

shielded wire. Insulated wire covered with a metal shield, usually of tinned, braided copper wire.

shielding. Metal covering used on a cable; also a metal can, case, partition, or plates enclosing an electronic circuit or component. Shielding is used to prevent undesirable radiation, pickup of signals, magnetic induction, stray current, or AC hum.

shock excitation. 1. Initiation of oscillations in a resonant circuit of a vacuum-tube oscillator by a pulse due to application of electrode voltages. 2. The reception of signals on an antenna not designed for the frequency of the signals, and due solely to the power of the initial radiation plus the proximity of the receiving antenna. (Also called shock reception.)

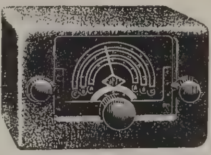
shoran. (SHOrt RAnge Navigation). An electronic marine-aircraft navigational aid for determining accurately and at short range, the position of ships and aircraft.

short circuit. A low-resistance connection across a voltage source or between the sides of a circuit or line; usually accidental and usually resulting in excessive current flow which often causes damage.

shorted out. Made inactive by connecting a heavy wire or other low-resistance path around a device or portion of a circuit, usually for protective purposes.

shorting contact switch. A rotary selector switch in which the width of the movable contact is greater than the distance between contact studs. A make-before-break switch.

short-wave converter. A radio device which can be connected between a broadcast receiver and its antenna system to permit reception of higher-frequency stations which the receiver could not otherwise receive. It consists essentially of an oscillator-mixer-first detector arrangement like that used in a superheterodyne receiver, and serves to convert the high-frequency signals to a broadcast band frequency which can be handled by the regular receiver.



Short-Wave Converter

short waves. A general term usually applied to wavelengths shorter than lower limit of the standard U.S. broadcast-band, 200 meters. Frequency is higher than 1600 kc.

short-wave transmitter. A radio transmitter that radiates short waves; ordinarily shorter than 200 meters.

shot effect. One type of limitation to extremely high amplification. At excessively low levels, signal variations become confused with random current fluctuations in the tube due to the fact that current consists of the migration to the plate of individual electrons.

shunt. 1. A precision low-value resistor placed across the terminals of an ammeter to increase its range by allowing a definite fraction of the circuit current to go around the meter. 2. Any part connected in parallel with some other part.

Short-Wave Transmitter

shunt feed. In vacuum tube amplifiers and oscillators, the application of DC voltage to the plate through a choke independently of the signal circuit or load.

sidebands. Two bands of frequencies, one on either side of the carrier frequency of a modulated radio signal; including components whose frequencies are, respectively, the sum and difference of the carrier and the modulation frequencies.

S.I.F. Abbreviation for the television term, sound intermediate frequency.

signal. The form or variation of a wave with time, serving to convey the information, message, effect, or other desired intelligence in communications.

signal converter. A cathode-ray tube about the size of an ordinary radio receiving tube, used to generate sweep voltages for the cathode-ray picture tube in a television receiver. Developed in Great Britain in 1943 (Nagard Type I and Type II).

Signal Generator

signal generator. A test instrument that generates an unmodulated or tone-modulated radio-frequency signal at any frequency needed for aligning or servicing electronic equipment. Also called an all-wave signal generator, oscillator, or test oscillator.

signal-noise ratio. The ratio of the radio field intensity of a received radio wave—to the radio noise field intensity received with the signal and/or inherent circuit noise.

signal plate. The metal plate that backs up the mica sheet containing the mosaic in one type of cathode-ray television camera tube. The capacitance existing between this plate and each globule of the mosaic is acted on by the electron beam to produce the television signal.

signal shifter. A trade name for a variable-frequency vacuum-tube oscillator used principally as the master oscillator of amateur radio transmitters.

signal strength. A measure of the power output of a radio transmitter at a particular location. Usually expressed as microvolts or millivolts per meter of effective height of the receiving antenna employed.

signal-strength meter. A meter connected in the AVC circuit of a receiver and calibrated in db or arbitrary "S" units to "read" the strength of a received signal. Sometimes called an S meter.

signal-to-noise ratio. See signal-noise ratio.

signal tracing. A radio-receiver servicing technique that involves tracing the progress of a radio signal through each stage of a receiver in order to locate the faulty stage.

signal-tracing instrument. A test instrument for signal tracing.

signal voltage. The effective (root-mean-square) voltage value of a signal. A modulating voltage of a transmitter or a detected voltage in a receiver. Term used in contradistinction to carrier voltage or noise voltage.

silent period. A period during each hour in which ship and shore radio stations listen for distress calls.

silicon detector. A form of crystal detector employing a piece of silicon in a particular crystalline state. A fine wire tip rests on the silicon, thus forming a rectifier. Used in early crystal sets; the principle is now used in micro-wave apparatus and for transistor elements.

silk-covered wire. Wire covered with one or more layers of fine floss silk.

simplex operation. Operation of a telegraph system in only one direction at a time. In radiotelegraphy this may involve using the same antenna alternately for transmission and reception.

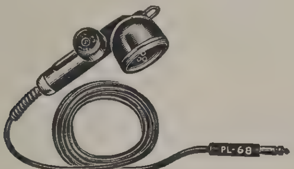
simplex telegraphy. Telegraphy employing simplex operation.

simulcasting. The transmission of a stereo program by employing an AM station and an FM station, each of which simultaneously broadcasts one of the required stereo channels. Rather than an AM and FM station, other combinations may be used, e.g., an AM and TV station, two FM stations, or an FM and TV station.

simultaneous transmission. A system of color television transmission in which the primary colors are transmitted at the same instant and are superimposed one over the other at the receiver.

sine wave. Wave form corresponding to a pure, single frequency oscillation. If amplitude is plotted against angle (or time, which is in proportion to angle) the curve is a sine function. From 0 to 90° (one quarter period) the amplitude increases as the sine of the angle. From 90° to 180° it decreases symmetrically with the increase, forming an arch (of one half period). During the interval 180° to 360° (the other half period), the arch is inverted and repeated in a trough. The periods or cycles then repeat.

sine wave clipper. A circuit which alters the shape of a sine wave so that it resembles a square wave. Sine wave clippers are used primarily in TV deflection circuits.



Single-button Carbon Microphone

single-button carbon microphone. A microphone having a carbon-filled, button-like container on only one side of its flexible diaphragm.

single-dial control. Control of a number of different units of equipment or circuits by a single adjustment. The circuits or units involved are said to "track."

single-ended tube. A tube in which all electrode connections, including the control grid, are made to base pins, there being no top pin.

single-gun color tube. A color picture tube which has only one electron gun and a single beam which is deflected across the phosphor dots sequentially.

single-phase. Pertaining to a circuit or device that is energized by a single alternating voltage. One of the phases of a poly-phase system.

single-pole switch. A switch having only one movable contact element. It should be noted that the word "pole" denotes the number of movable contact elements, regardless of the number of connections that can be made, the latter being denoted by the number of "throws".

single-sideband transmission. A mode of radio transmission in which the RF carrier and one of the two sidebands produced by amplitude modulated signals is suppressed at the transmitter. The one sideband carries all of the intelligence. Used in wired radio and trans-ocean telephony.

single-signal receiver. A superheterodyne receiver equipped with a highly selective intermediate-frequency amplifier. This sharp IF amplifier passes only one beat-note of a code signal and partially or completely rejects the other beat note.

single-signal reception. Reception by a single-signal receiver.

single-throw switch. A switch which can be closed in only one position, thus always closing the same contact or set of contacts. May be single, double, triple or multiple pole.

single-wire line. A transmission line that utilizes the ground as one side of the circuit.

sink. A power-consuming device, such as the load in a circuit.

sinusoidal. Varying in proportion to the sine of an angle or time function. Ordinary alternating current is sinusoidal.

sinusoidal wave. A sine wave.

six-electrode tube. A hexode.

skin effect. Concentration of current density toward the surface of a conductor due to the self-induced counter electromotive force of an alternating current. It results in an increase in the effective resistance. The effect is especially noticeable at radio frequencies because skin effect increases with frequency.

skip zone. A ring-shaped region around a transmitter within which there is no reception from the transmitter. The outer edge of the ring is fixed by the skip distance; the inner edge marks the limit of reception of the ground wave.

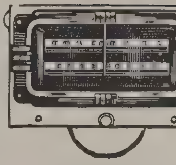
skip distance. The minimum distance at which radio waves of a specified frequency can be transmitted at a specified hour or time of day between two points on the earth by reflection from the regular ionized layers of the ionosphere.

sky wave. A radio wave that is reflected back to earth from the ionosphere. Sometimes called ionospheric wave.

sleeve. 1. The cylindrical metal contacting part immediately back of the tip in a telephone or radio type plug. 2. The insulating jacket that fits over the cone of metal-cone television kinescopes. 3. Spaghetti insulating tubing, used as a sleeve over wire.

slider. A sliding type of movable contact.

slide-rule dial. A radio receiver tuning dial in which a pointer moves in a straight line across long straight scales resembling those of a slide rule.



Slide-Rule Dial

slip rings. The collector rings mounted on the rotor shaft of an alternating-current generator to transfer the current to the external circuit through brushes pressing against the slip rings.

slope. The grid-voltage plate-current characteristic curve of a vacuum tube which is essentially linear. For linear amplification, an operating point is chosen on this curve or slope.

slow acting relay. A time delay relay. A relay in which an interval of time may exist between energizing or de-energizing of the coil and attraction or releasing of the armature respectively.

slow-release relay. A relay in which there is a delay between de-energizing of the coil and release of the armature.

slug. A heavy metal ring or short-circuited winding placed on the core of a relay to give a time delay in its operation. Also, the movable iron core of an inductor; by moving the slug in or out, the inductance is varied, thus permitting adjustment of the coil to the frequency desired.

smear. Lack of detail or definition in a television image caused by attenuation of high frequencies in the video IF or amplifier of a TV receiver.

S meter. A signal-strength meter.

smoothing choke. An iron-core inductor employed as a filter to remove pulsations in the unidirectional output current of a rectifier or direct-current generator.

smoothing filter. A filter composed of inductance and capacitance (or either alone) to remove AC components from the unidirectional output current of a rectifier or direct-current generator. See example under filter.

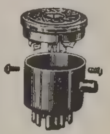
snap-around ammeter. An AC ammeter that measures electrical current without the need for inserting it in series with the current-carrying wire. Ammeters of this type employ snap-around jaws which encircle the current-carrying wire. Current in the wire is transmitted by induction to the snap-around jaws, which in turn are connected to the meter movement. Snap-around ammeters often include a volt scale to permit measurement of voltage in the conventional manner.

snap switch. Any switch in which the contacts are separated or brought together suddenly by the action of a spring placed under tension by the operating knob or lever.

snow. White spots on a television picture which are produced by inherent noise in the television receiver antenna system and circuitry. Snow is an indication of inadequate signal strength, since a signal not sufficiently strong will not mask antenna and circuit noise. The greater the signal-to-noise ratio of a television receiver, the better will a signal of given strength mask the snow.

socket. A mounting device for tubes, plug-in coils, plug-in capacitors, plug-in resistors and crystals, having holes with spring clips arranged to fit and grip the terminal prongs of the part being plugged in. Also a bayonet or screw type socket for pilot lamps.

socket adapter. A device placed between a tube socket and a tube, to permit use of the tube in a socket designed for some other type base, or to permit resistance or voltage measurements at electrodes while the tube is in use.



Socket Adapter

soft tube. A vacuum tube that has not been fully evacuated, or that has emitted or admitted gas.

solder. An alloy of lead and tin which melts at a fairly low temperature (about 500°F) and is used for making permanent electrical connections between parts and wires. Silver solder, which has a much higher melting point, is composed of silver, copper and zinc.

soldering iron. A device used to apply heat to a joint which is to be made permanent by soldering.

solder gun. A soldering iron having an appearance similar to that of a pistol. Usually has a fast-heating resistance element at the tip, which operates at high current and low voltage from a step-down transformer built into the unit.

Solder Gun

solenoid. 1. An electromagnet having an energizing coil approximately cylindrical in form, acting on a movable ferromagnetic core or plunger positioned in the center of the coil. 2. A cylindrical coil.

solid conductor. A single wire. A conductor that is not divided into strands.

sonar. (SOund Navigation And Ranging.) Electronic equipment used for underwater detection of objects, distance or range to these objects, determination of ocean depth and profile, etc. Sonar gear utilizes frequencies in the audio and supersonic portions of the spectrum. Sound pulses are sent through water, picked up after reflection from underwater objects, and the time elapsed between departure and arrival of pulses measured electronically. This data is then converted into distance from the target. For underwater communications, the sound is keyed according to International Code.

sonic. Pertaining to or utilizing sound waves.

SOS. The international marine distress signal for radiotelegraphy.

sound. A vibration of a body at a rate which can be heard by human ears. The extreme limits of human hearing are about 20-20,000 cycles per second. Sound can travel through any medium which possesses the ability to vibrate; the vibrations are called sound waves.

sound analyzer. An electronic apparatus, such as an oscilloscope, harmonic analyzer or audiometer, used to measure sound levels and analyze frequency components in an audio signal.

sounder. A telegraph receiving instrument.

sound intensity. The sound energy transmitted per unit of time in a specified direction through a unit area perpendicular to this direction. It is expressed in ergs per second per square centimeter or in watts per square centimeter. Also called flux density or sound energy flux density.

sound-on-disc recording. The recording of an audible intelligence signal on conventional phonograph records.

Sound-powered Telephone

sound-powered telephone. A telephone operating entirely on current generated by the speaker's voice, hence requiring no batteries or power supply. A diaphragm, activated by sound waves, moves a small coil through a magnetic field, producing a current in the coil.

sound pressure. The root-mean-square value of the instantaneous sound pressures at a point over a complete cycle. Measured in dynes per square centimeter. Also called effective sound pressure.

sound wave. A traveling or standing wave produced by vibrations in an elastic medium at a sonic rate.

source. A term sometimes used to describe the part which is supplying electrical energy or radio signals to a circuit.

source impedance. The apparent impedance of the signal source. It may or may not be equal to the recommended load impedance. The lower the source impedance, the better the voltage regulation. Inverse feedback in an audio power amplifier reduces source impedance, resulting in better speaker damping.

south pole. The pole of a magnet at which magnetic lines of force are assumed to enter; they emerge from the north pole. If the magnet is free to move, its south pole will point to the earth's north magnetic pole. Also called "north-seeking" pole.

space charge. A gathering of electrons near the cathode of a vacuum tube. Being negative, it tends to limit the number of electrons which can reach the plate, for a given plate voltage, and hence limits the plate current.

space-charge grid. An application of the number one grid of a tetrode in which it is used with the cathode to produce a large virtual cathode; the number two grid serving as control grid.

space-charge law. Child's Law, to the effect that emission current is proportional to the three halves power of the applied potential. Gives a guide to operation of tubes of widely diverse geometries.

space cloth. Carbon-impregnated cloth used as a wave-guide termination.

space current. The current made up of electrons moving from the cathode to the plate and other positive electrodes in a thermionic vacuum tube.

spacing wave. An undesirable signal heard from a radiotelegraph transmitter when the sending key is open between the marking portions of the code characters or between messages, due to maladjustment of the transmitter. Also called back wave.

spade bolt. A type of bolt having a threaded section and one spade-shaped flat end in which there is a hole to accept a screw or rivet. Spade bolts are used to fasten shielded coils, capacitors, and various other components to radio, TV, and other electronic equipment chassis.

spaghetti. Heavily varnished cloth tubing sometimes used to provide insulation for radio circuit wiring.

spark. A momentary flash due to an electric discharge through air or some other dielectric material.

spark coil. An induction or Tesla coil used to produce spark discharges.

spark frequency. The number of sparks occurring per second in a spark transmitter.

spark gap. An arrangement of two electrodes between which sparks are to be produced.

sparking. Intentional or accidental spark discharges, as between the brushes and commutator of a rotating machine, between contacts of a relay or switch, between rotor and stator plates of a variable capacitor, or at any point at which an inductive circuit is broken.

sparking voltage. The minimum voltage at which a spark discharge occurs. The starting potential of a cold cathode gas tube.

sparkover. Breakdown of the air between two electrodes permitting the passage of a spark.

spark transmitter. An early type of radio transmitter, then called a "wireless sending set" or "wireless sender," that utilized the oscillatory discharge spark gap as the source of its radio frequency signals.

spdt. Abbreviation for single-pole, double-throw, applying to a switch or relay contact arrangement.

speaker. A loudspeaker.

speaker damping. When a signal is applied to the voice coil of a speaker there may be some tendency for the speaker to oscillate or vibrate after the change in signal. If the speaker comes to rest after cessation of the signal or vibrates only at the applied frequency, the speaker is damped. See damping factor.

speaker efficiency. The efficiency of a loudspeaker depends upon the amount of energy loss (heat) developed in the transfer of electrical energy (power) to acoustical energy. The less loss, the higher the efficiency. If a speaker radiates .5 watt of acoustical power when 10 watts have been fed into the voice coil, it has an efficiency of 5%.

speaking arc. A direct-current arc having audio-frequency currents superimposed on the direct current. This causes the arc to vary its light output at an audio-frequency rate. Sometimes used for sound-on-film recording.

specific gravity. The ratio of the weight of a substance to the weight of an equal volume of water.

specific resistance. Resistivity.

spectral color. Visible colors that appear in the spectrum of white light. Basic spectral colors are violet, blue, green, yellow, orange, and red.

spectral sensitivity. The relative response of a photosensitive device to the various wavelenths within its range of response. As an example, some photo-tubes have a spectral sensitivity which is high in the blue region, while other tubes are more sensitive to red.

spectroscope. An instrument which, by means of a prism or grating and appropriate collimating and focusing equipment, separates light or similar radiation into its constituent wavelengths and permits their measurement.

spectrum. Any series of radiant energies arranged in order of wavelength. The entire range of electromagnetic radiation extending from the longest known radio waves to the shortest known cosmic rays.

speech amplifier. An audio-frequency amplifier used between the microphone or audio sound converter and the input of the power amplifier to raise the output voltage of the microphone or converter to the required power amplifier input level to assure the amplifier's full output. Generally used with radiotelephone transmitters, and also with public address amplifiers.

speech clipper. An electronic circuit using one or more biased diodes for the purpose of limiting the wave crests of speech frequency signals. Used especially in speech amplifiers of Amateur transmitters to maintain a high average modulation percentage.

speech frequency range. Audio frequencies from about 100 to 2,000 cycles. In audio equipment, the frequency range necessary for intelligible speech.

speech inverter. See scrambled speech.

sphere gap. A spark gap between two spherical electrodes.

spherical aberration. An optical term for image defects that are due to the spherical form of a lens or mirror. Because of this defect, light is prevented from coming to a sharp focus on the principal axis.

spider. A highly flexible fiber ring which serves to center the voice coil of a loudspeaker without appreciably hindering the in-and-out motion of the voice coil and cone. Also, a circular insert which is snapped into the large center-hole of 45-rpm records to permit using the records on a conventional spindle.

spider-web antenna. An all-wave receiving antenna having several different lengths of doublets connected somewhat like the web of a spider.

spider-web coil. A flat coil having an open weave like the bottom of a woven basket, used in early radio receivers.

spiral tuner. Also called continuous tuner. A type of tuner circuit used in TV sets and other VHF (very high frequency) receiving equipment. It has spiral coils and a tuning mechanism which slides a contact along the spiral of each coil. The sliding contacts change the inductance of the coils and thus change the frequency.

splice. A connection of two or more conductors or cables to provide good mechanical strength as well as good conductivity.

split-anode magnetron. A magnetron in which the cylindrical anode is divided longitudinally into halves, between which extremely high-frequency oscillations are produced.

split image. Descriptive term for the showing of two or more adjacent television images on the screen of a picture tube.

split magnetron. A split-anode magnetron tube.

split-sound system. A television IF system wherein the audio and video signals are separated after the mixer stage and amplified in separate IF stages.

split-stator variable capacitor. A variable capacitor having a rotor that is common to two separate stator sections.

sporadic E layer. That portion of the normal E layer in the ionosphere that sometimes breaks away and exhibits special erratic characteristics.

sporadic reflections. Sharply defined reflections of radio waves from an ionized layer of the ionosphere, occurring at frequencies greater than the critical frequency or penetration frequency of the layer. Sometimes called abnormal reflections.

spot. The luminous area produced on the viewing screen of a cathode-ray tube by the electron beam.

spottiness. Bright spots scattered irregularly over the reproduced image in a television receiver, due to man-made or static interference entering the television system. Sometimes called snow.

spreader. An insulating crossarm used to hold apart the wires of a transmission line. In antennas, it is the crossarm separating the parallel wire elements

spring contact. A relay or switch contact mounted on a flat spring, usually of phosphor bronze.

spring-return switch. A switch which returns to its normal position when pressure is released.

spst. Abbreviation for a single-pole, single-throw switch or relay.

spurious radiation. Any radiation from a radio transmitter at frequencies other than its operating frequency.

spurious response. Reception in a radio receiver at one or more frequencies other than that to which it is tuned.

square-law detector. A vacuum-tube circuit in which the output signal current strength is proportional to the square of the radio-frequency input voltage. The demodulation depends on curvature or non-linearity of the characteristic, rather than on rectification, to produce the distortion or asymmetrical form of the modulated wave necessary for detection. The largest distortion term is the second power, or square term.

square mil. An area equivalent to a square having sides 1 mil (0.001 inch) long.

square wave. The waveform of a quantity that shifts abruptly from one to the other of two definite values, giving a square or rectangular pattern when amplitude is plotted against time.

square-wave generator. A signal generator used to produce square or rectangular waves.

squawker. A term sometimes applied to the mid-range speaker in a three-way speaker system.

squealing. A condition in which a high-pitched note is heard along with the desired radio program. It can be due to heterodyne interference between stations.

squelch circuit. An AVC circuit that reduces or attentuates the noise otherwise heard in a radio receiver between signals by blocking some stage when the signal amplitude is below a value called the squelch level.

ssc. Abbreviation for single silk-covered wire.

sse. Abbreviation for single silk enamel covered wire.

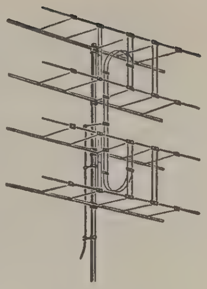
stability. Freedom from changes due to any cause, hence maintaining certain characteristics constant despite varying voltage, temperature, etc. Examples: absence of frequency drift or fluctuations; lack of tendency of an amplifier to break into oscillation.

stabilized feedback. A vacuum tube circuit where part of the plate energy is fed back 180 degrees out of phase to the input signal. Used in RF circuits to prevent regeneration and in audio amplifiers to improve frequency response and reduce distortion. Also called negative feedback, degeneration, and inverse feedback.

stacked array. An array in which half-wave antenna elements are placed one above the other.

stacked dipoles. Two or more dipole antennas arranged one above the other on a vertical supporting structure.

stage. All the components in a circuit containing one or more vacuum tubes having one single input and one output, the input receiving power from a preceding stage or device, and the output feeding power to a succeeding stage or device.



Stacked Array

staggered tape system. A method of stereo recording and playback in which two tape heads are mounted side-by-side with their respective gaps spaced 1¼″ apart. Also known as the offset method. Most tape recorders use in-line (see in-line tape system) rather than staggered heads.

stagger tuning. Commonly used in television receivers and high-fidelity radio tuner circuits. A means of securing a wide band width in a multistage IF amplifier by detuning pairs of the tuned circuits in opposite directions by a specified amount.

standard broadcast band. Frequencies extending from 535 to 1605 kilocycles.

standard broadcast channel. A band of frequencies 10 kilocycles wide, consisting of the carrier and two sidebands. Channels are designated by their assigned frequencies.

standard-frequency signal. Highly accurate signals broadcast by radio station WWV of the National Bureau of Standards at Washington, D.C. These signals are used throughout the world for calibration and testing of radio equipment. See WWV.

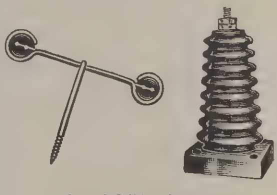
standing wave ratio. The ratio of current (or voltage) at a loop in a transmission line to the value at a node. The square of the voltage ratio is the standing wave ratio in power. It is equal to the ratio of the characteristic impedance of the line to the impedance of the load connected to the output end of the line.

standing wave ratio bridge. A device for determining the standing wave ratio of radio and television transmission lines. Normally used to determine if transmission line is properly matched to the antenna system.

standing waves. Stationary waves. The result of reflection. Produced by interaction of two waves of the same frequency traveling in opposite directions.

stand-off insulator. An insulator used to support a wire at a distance from a building or pole on which the insulator is mounted.

starter-anode glow tube. A cold cathode triode such as the OA4. The cathode is a large disc near which is a wire ring grid. The ignition potential between the two is low. The anode is small (to effect rectification). The cathode-anode ignition potential is high. With plate voltage established, the discharge may be triggered by an insignificant amount of power in the grid circuit.



Stand-Off Insulators

starting anode. An electrode used to establish the initial arc or to prevent extinction in a mercury-arc rectifier or similar tube.

starting current. The minimum beam current required to maintain oscillation in a klystron.

static. Noise heard in a radio receiver due to atmospheric electrical disturbances such as lightning, or man-made causes such as electric motors, neon signs, electric shavers or other appliances which produce sparking in operation.

static charge. An electric charge accumulated on an object, usually by friction.

static convergence. In color TV, the condition in a three-gun color tube characterized by convergence of the three beams in an opening at or near the center of the shadow mask

static eliminator. A device designed to attenuate the effect of static interference in radio or electronic equipment.

static focus. The focus of the electron beam when it is at the position it would occupy if scanning energy was not applied.

static machine. A machine for generating electric charges.

static pressure. The pressure that would exist in a medium if no sound waves were present. The unit is the dyne per square centimeter.

stator. 1. The part of a rotating machine which contains the stationary parts of the magnetic circuit and their associated windings. 2. The stationary set of plates in a variable capacitor.

stator plates. The fixed or stationary plates used in a variable capacitor. Usually, they are insulated from the frame of the capacitor.

steatite. Soapstone Talc. A mineral consisting chiefly of a silicate of magnesium; has excellent insulating properties. It is fired into a hard ceramic to form insulators and high dielectric strength sheets.

Stellite. An alloy of tungsten which is sometimes employed for the tip of a cutting stylus in disc recording.

step-down transformer. A transformer in which the secondary winding has fewer turns than the primary, so that the secondary delivers a lower voltage than is applied to the primary.

stepping relay. A relay having contacts which move to successive positions each time the actuating coil is energized. Also called rotary stepping switch or rotary stepping relay.

step-up transformer. A transformer in which the secondary winding has more turns than the primary, so that the secondary delivers a higher voltage than is applied to the primary.

stereophonic sound. A kind of reproduced sound which not only has depth and direction, but which to a great extent, captures the acoustics of the place of performance. Stereophonic sound is recorded with two microphones, one placed toward the right and one toward the left of the orchestra or other performers. The sounds picked up by each are kept apart throughout the recording and playback processes. Playback is through separate amplifiers (or a stereo amplifier) and through two speaker systems. Stereo recordings are available on records and tape. There are also stereo broadcasts (see simulcasting and multiplex).

stereo cartridge. A special type of phonograph pickup used in stereophonic phono systems for playing stereophonic records. It contains two voltage-producing elements coupled to a single high-compliance needle.

stopping capacitor. A capacitor used in some branch of a circuit to block the flow of direct current while allowing signal or alternating currents to pass. Commonly called a blocking capacitor.

storage cell. A voltaic cell which, after being discharged, may be restored to a charged condition by an electric current sent through the cell in a direction opposite that of the discharging current. Also called secondary cell.

storage battery. A unit consisting of two or more storage cells.

storage tube. A television cathode-ray camera tube. The image is projected on a photosensitive plate and elemental areas of the plate build up their charges gradually until discharged by the moving electron beam. Each area thus develops a picture signal that is proportional to its illumination.

straight dipole. A half-wave antenna consisting of one conductor and usually center fed.

straight-line capacitance. A variable capacitor characteristic obtained when the rotor plates are so shaped that the capacitance varies directly in proportion to the angle of rotation.

straight-line frequency. A variable capacitor characteristic obtained when the rotor plates are so shaped that the resonant frequency of the tuned circuit containing the capacitor varies directly in proportion to the angle of rotation.

straight-line wavelength. A variable capacitor characteristic obtained when the rotor plates are so shaped that the resonant wavelength in the tuned circuit containing the capacitor varies directly in proportion to the angle of the rotation.

strain insulator. An insulator inserted in a guy wire, antenna, or other stretched wire to break up the wire into insulated sections.

strain pickup. A phonograph pickup in which stylus movements cause stretching and contraction of an element. These changes in the shape of the element vary its resistance, thereby modulating the current flowing through it.

stranded wire. A conductor composed of a group of wires or of any combination of groups of wires.

stray capacitance. Capacitance existing between circuit wires or parts, or between the metal chassis of electronic apparatus and the components mounted on it.

stray field. Stray inductance. Leakage magnetic flux that spreads outward from an inductor and does no useful work.

strays. Electromagnetic disturbances that affect reception but are not produced by radio transmitting systems.

striking potential. 1. The voltage required to start an electric arc. 2. In a gas-filled triode, the smallest grid-cathode potential value at which plate current begins to flow.

stroboscope. An instrument which consists of an intense light source and means of causing this source to flicker at a variable controlled frequency.

stroboscopic disc. Also known as stroboscopic card. A specially printed disc carrying a series of lines or dots or both, which, when placed on a rotating record player turntable, under proper lighting indicates whether or not the turntable is turning at the correct speed.

strobotron. A neon lamp used with a reflector as the light source in a stroboscope.

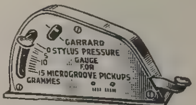
stub. A shorted or open impedance path between the two conductors of a transmission line or in a wave guide. It is adjustable as to position so as to match the impedance of an antenna or transmitter to that of a transmission line.

stylus. 1. The specially shaped needle used in a sound recorder to cut the record grooves. 2. A record playback needle.

stylus drag. Friction between the surface of a record groove and the reproducing stylus of a phonograph pickup.

stylus pressure. The vertical pressure exerted by a phonograph stylus (needle) on a record disc. Stylus pressure is usually measured in grams.

stylus pressure gauge. A type of pressure indicator used to determine how much vertical pressure a phonograph stylus would exert on a record disc. A stylus pressure gauge usually indicates pressure in grams. The end of the pickup arm is placed on the gauge.



Stylus Pressure Gauge

subcarrier. In television, a carrier signal inserted within the picture-frequency pass-band to provide a channel for the transmission of additional information.

sub-harmonic frequency. A frequency that is an integral submultiple of the fundamental frequency. *e.g.*, a second sub-harmonic would be one-half the fundamental frequency; a third sub-harmonic would be one-third the fundamental frequency; etc.

subminiature tubes. Electron tubes of very small size, generally used in miniaturized equipment such as hearing aids, etc. There is no fixed number of pins.

subtractive color. A system which subtracts two colors from white light and leaves the required color.

SUP. Used on circuit diagrams to denote the suppressor grid of a vacuum tube.

superaudible. A sound wave having a frequency above approximately 20,000 cycles per second, beyond normal hearing range.

superaudio frequency. A sound wave frequency above 20,000 cycles per second.

super-control tube. See variable mu tube.

superhet. Popular name for a superheterodyne circuit, or a superheterodyne receiver.

superheterodyne receiver. A type of radio in which the incoming modulated RF signals are sometimes amplified a small amount in the preselector, then fed into the frequency converter section (consisting of the oscillator, mixer and first detector) for conversion into a fixed, lower carrier frequency called the intermediate frequency (IF) value of the receiver. The modulated IF signals are highly amplified in the IF amplifier stages, then fed into the second detector for demodulation. The resulting audio signals are amplified in the conventional manner by the audio amplifier, then reproduced as sound waves by the loudspeaker.

super-high frequency. A frequency in the band extending from 3,000 to 30,000 mc.

super-regeneration. A circuit design of some special-purpose radio receivers, in which a detector oscillates periodically at the received frequency, and is then quenched by another oscillator at a frequency above the audible range. Advantages are extreme sensitivity, simplicity and minimum number of tubes and parts. Drawbacks of this type of circuit are the poor selectivity, interference-causing radiation, and the possibility of oscillation not caused by the received signal.

super-regenerative detector. A regenerative detector in which maximum regeneration is employed, but in which sustained oscillation is prevented by a separate quenching oscillation derived either in the same or in an external circuit. Quenching oscillation applies a positive bias to the grid of the detector.

super-regenerative receiver. A receiver employing a super-regenerative detector. It is generally of the tuned radio frequency type.

supersonics. See ultrasonics.

super-sync. A radio signal transmitted at the end of each scanning line which synchronizes the operation of the television receiver with that of the television transmitter.

supply. Source of voltage, current or power.

suppressed carrier transmission. A system of carrier transmission in which the carrier component of the modulated wave is suppressed, only the side frequencies being transmitted. Used in telephony.

suppressor. A resistor inserted in series with the spark plug lead or the distributor lead of an automobile engine to suppress spark interference which might otherwise interfere with reception of radio programs in the auto radio set.

suppressor grid. A grid interposed between two electrodes (usually the screen grid and plate), in order to prevent the passing of secondary electrons from the latter to the former. This grid is usually connected to the cathode.

suppressor modulation. A type of amplitude modulation used with pentode RF (radio frequency) amplifiers. The modulating voltage is superimposed on the bias voltage applied to the suppressor grid. Efficiency and plate current of the RF amplifier vary proportionately with the amplitude of the modulating wave.

surface leakage. The passage of current over the surface of an insulator rather than through it.

surface noise. Noise components in the output of a phonograph pickup due to irregularities on the surface of the disc. Also called needle scratch.

surge. A sudden and transient variation in the current and/or potential at a point in a circuit, such as that due to sudden application of voltage to a circuit. A surge having undirectional polarity is called an impulse.

surge impedance. See characteristic impedance.

susceptance. The quadrature part of admittance. Loosely it is the reciprocal of reactance. Strictly, it is the reactance divided by the square of the impedance. Susceptance is in mhos. Symbol is B.

sustained oscillation. Continuous oscillation in which a predetermined frequency is maintained.

sw. Abbreviation for switch. Used on diagrams.

S-W. Abbreviation for short-wave.

sweep circuit. A special oscillator circuit which generates a voltage having a saw-tooth wave form suitable for making the electron beam of a cathode ray tube sweep back and forth across the fluorescent screen.

sweep generator. A generator of a radio frequency signal, the frequency of which varies above and below the mean frequency at a rapid and constant rate. When fed to a receiver, the demodulated signal is viewed on an oscilloscope, the pattern indicating radio frequency response of the tuned circuits in the receiver.

sweep voltage. The periodically varying voltage produced by a sweep oscillator.

swinging. A momentary variation in the frequency of a radio wave.

swinging arm. A type of mounting and feed used to move the cutting head at a uniform rate across the recording disc in some sound recorders. All phonograph pickups are of the swinging-arm type.

swinging choke. An iron-core choke coil used in rectifier filter circuits. The core is operated almost at magnetic saturation. The inductance of the coil then varies or swings when the average current value through the coil changes providing improved voltage regulation.

switch. A mechanical device for completing, interrupting, or changing the connections in an electric circuit.

SWL. Abbreviation for Short-Wave Listener.

symbol. A simple design used to represent a radio part in a schematic circuit diagram. A letter used in formulas to represent a particular quantity.

sync. Abbreviation for synchronizing, usually voltage, as required in television receivers (and cathode-ray oscilloscopes).

synchronism. Of the same frequency and in phase. If the frequencies are the same but the phase relations are random, the term isochronism applies. Synchronism is used loosely to cover both cases.

synchronization. The maintaining of one operation in step with another. In television, the process of keeping the electron beam of the television picture tube in exactly the same relative position as the scanning beam of the camera tube.

synchronizing generator. In television, an electronic generator which supplies synchronizing pulses to TV studio and transmitter equipment.

synchronizing pulse. Sync pulses. One of the pulses added to the video output signal of a television camera for the purpose of synchronizing television receivers with the transmitter.

synchronizing separator. The television receiver circuit that separates the control impulses from video signals. Also called amplitude separator or clipper.

synchronizing signals. Special signals sent out by a television transmitter between successive lines and between successive fields to keep the scanning motions of television receivers in step with that at the transmitter.

synchronous demodulator. A circuit in a color TV receiver which changes the carrier chrominance signal into color difference signals. These are used with the Y luminance signal to obtain the receiver primary signals. A bandpass filter with a response from 2.4–4.5 mc separates the carrier chrominance signal from the video signal. This chrominance signal is fed to two synchronous demodulators. In one it is mixed with a subcarrier signal in phase to obtain the I signal, and in the other it is mixed with a subcarrier component in quadrature (90° from the first) to obtain the Q signal. Other circuits using triodes and diodes are used to obtain the color difference signals of R–Y and B–Y.

synchronous switch. A circuit in which thyratrons control the operation of ignitrons in such applications as resistance welding. Operation may be controlled so as to give a single pulse, any fraction of a series of cycles or off-on contact.

synchronous vibrator. An electromagnetic vibrator that simultaneously converts a low direct voltage to a low alternating voltage and rectifies a high alternating voltage obtained from a power transformer to which the low alternating voltage is applied. In power packs, it eliminates the need for a rectifier tube.

sync-signal generator. A synchronizing signal generator for a television receiver or transmitter.

synthesis of periodic waves. The building up of complex wave forms by superimposition of harmonics on a fundamental frequency. Acoustically it is possible to simulate the tones found in musical instruments or speech. Graphically, it is possible to reproduce any irregular curve in periodic repetition.

system of beams. In color television, the three electron beams emitted by the triple electron-gun assembly. They occupy positions equidistant from a common axis and are spaced 120 degrees apart around the axis.

T

T. Generally used to designate a transformer in circuit diagrams.

tachometer. An instrument for measuring rotational speed in revolutions per minute.

tailing. On a television screen, a prolongation of the luminous spots. Also called hangover.

talk-listen switch. A switch provided in intercommunication units to permit alternate use of the loudspeaker as a microphone or speaker.

tangent (tangency). Portion of the straight line tangent to a curve between the point of tangency and a given line. This term is used in relation to phonograph pickup arms when the principal axis is tangent to the record groove.

tank circuit. An inductor and a capacitor in a parallel connected resonant circuit. Since such a circuit has the ability to store energy for a short period of time, it acts as a reservoir or tank. Hence the name tank circuit.

tantalum. A refractory metal used for grids and plates of power tubes. It possesses the property of absorbing gases and thus obviates the need of more volatile getters.

tantalum detector. A detector consisting of the tip of a fine tantalum wire just touching the surface of a pool of mercury.

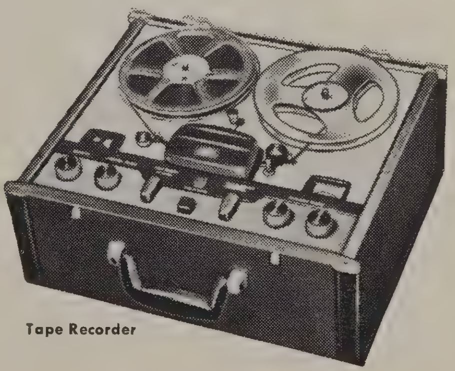
T-antenna. A system of conductors consisting of one or more horizontal wires, with the lead-in connection made at the center.

tap. A connection point or contact made in the body of a resistor or coil.

tape deck. A basic tape transporting mechanism. Usually includes a recording and playback head, and sometimes an erase head. A deck must be used with associated circuitry.

taper. A characteristic of the distribution of resistance throughout the element of a potentiometer or rheostat. When this is uniform, having the same resistance per unit length throughout, the taper is called linear. When non-uniform, it is called a non-linear taper.

tape recorder. A mechanical-electronic device for recording voice, music and other audio frequency material. In a tape recorder, sound is converted to electrical energy which in turn sets up a magnetic pattern on iron oxide particles suspended on plastic-base tape. At any given instant, this magnetic pattern corresponds to the original sound source. During playback, this magnetic pattern is recon-



Tape Recorder

verted to electrical energy and then changed back to audible sound through the medium of headphones or a loudspeaker; the recorded material may also be converted to visual sound by the use of an oscilloscope, other visual indicator, or graph recorder. Also used for the magnetic recording of the video material for television programs.

tape transmitter. A code-transmitting device actuated by pre-punched paper tape; used for high-speed radiotelegraphy.

tapped control. A rheostat or potentiometer having fixed taps between the ends of the resistance element.

tapped resistor. A wire-wound fixed resistor having one or more taps.

tap switch. A multi-contact switch, usually rotary. A key type switch which is tapped with the finger to produce momentary contact.

target. 1. An insert, usually of tungsten or molybdenum, in the anode of an X-ray tube. 2. The electron-collecting electrode of a Farnsworth dissector television camera tube. 3. An object capable of reflecting radar or sonar pulses. 4. One of the electrodes in a magic eye tube.

tearing. An undesirable effect in the received television picture, caused by unstable horizontal synchronization.

Technician license. A class of Amateur license issued in the United States. The examination questions for this license are always mailed to the applicant, and the exam is then conducted and supervised by not more than two qualified persons at the home of the applicant or other convenient location. The written examination is the same as for the General Class (full privilege) license. The code examination for the Technician license consists of a sending and receiving test at five words per minute; like the written exam, it is given at the home of the applicant or other convenient location. Holders of the Technician license are permitted to operate on 50 to 54 mc and all Amateur frequencies above 220 mc, and have full Amateur privileges on these frequencies. The license is valid for a period of five years, after which time it is renewable.

telautograph. A device which converts handwriting into electrical impulses at the transmitting position, and back to handwriting at the receiving position.

telecamera. A television camera.

telecast. A television program.

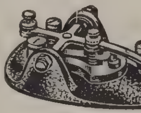
telecine projector. A motion-picture projector for displaying television by means of motion-picture film.

telecommunication. Interchange of intelligence by wire or radio telegraphy, telephony, television or other means.

telegraph key. A hand-operated device used to telegraph code.

telegraph sounder. A telegraph receiving device that converts code signals into sounds.

telegraphy. Communication by code signals sent by electrical or electronic means, with or without connecting wires.



Telegraph Key

telemetering. The transmission of readings of meters or gauges to remote locations. May be by radio or other means.

telephone. A device for converting sound waves into electrical impulses, sending these over wires and reproducing the original sound.

telephony. Transmission and reproduction of audio sounds by electrical or electronic means, with or without connecting wires.

telephoto. Transmission of photographs or other single images over a wire by electrical or electronic means. Also called facsimile, phototelegraphy, wirephoto, etc.

teleprinter. A simplified version of a teletypewriter system which uses a typewriter keyboard device for transmission and a motor-driven tape printer for reception.

teletypewriter. A printing telegraph instrument having a typewriter keyboard for sending messages, and a motor-driven signal-actuated mechanism for printing received messages directly.

television. The transmission and reception of a rapid succession of images by means of radio waves travelling through space or over wires.

television broadcast band. The several channels in the high frequency region that are available for television broadcast stations.

television camera. The pickup unit used in a television system.

television channel. A band of frequencies 6 mc wide, for a single television broadcast station.

television engineering. That phase of radio engineering which deals with the theory and practice of transmitting and receiving television programs.

television receiver. A receiver having complete channels for receiving the television picture and its associated sound. Standards established by the Radio-Electronics-Television Manufacturers' Association (now EIA) specify that a set receiving pictures only, must be called a picture receiver. Also called teleset.

television transmitter. The radio transmitter for the transmission of both the visual (picture) and aural (sound) signals of a television program.

televisor. Early name for the scanning apparatus used in a mechanical television system.

telex. An audio-frequency teleprinter system used in Europe for transmitting teletypewriter service over telephone wires.

temperature-compensating capacitor. A capacitor whose capacitance slightly and predictably varies with temperature.

temperature control. A relay actuated by a thermostat.

temperature relay. A relay that functions when temperature of equipment associated with the relay changes to a predetermined value.

temperature saturation. In a thermionic vacuum tube, the point at which plate current no longer increases when cathode temperature is increased (plate voltage remaining constant). Results from space charge surrounding the cathode. *Syn.:* filament saturation, cathode saturation.

terminal. Any fitting for convenience in making electrical connections.

terminal impedance. The impedance as measured at the input or output terminals of equipment.

terminated line. A transmission line terminated in the characteristic impedance of the line.

termination. The load connected to the output end of a transmission line.

tertiary winding. A third winding added to the primary and secondary windings of a transformer. Used for making connections of a power-factor correcting device, for minimizing third harmonics, or for obtaining voltage for negative feedback.

Tesla coil. An air-core transformer having a few turns of heavy wire as primary and many turns of fine wire as secondary. The oscillatory discharge across a spark gap applied to the primary results in extremely high value of high-frequency voltage across the secondary, which is capable of producing a brush discharge between widely separated electrodes in air. Also called Tesla transformer.

test board. A board or panel provided with instruments, terminals and equipment for testing electronic apparatus.

test lead. A flexible insulated lead, usually with a test prod at one end, for making tests, connecting instruments to a circuit temporarily, or making other temporary connections.

test oscillator. A test instrument that will generate an unmodulated or tone-modulated radio-frequency signal at any desired frequency for aligning or servicing electronic equipment. Also called an all-wave signal generator or signal generator.

test pattern. A drawing containing a group of lines, circles, or diagrams, used for television test purposes.

test prod. A metal point attached to an insulating handle and connected to a flexible test lead.

test record. A type of phonograph record for checking and adjusting audio reproduction systems. Test records are used to determine frequency response and distortion; also to check the synchronization of binaural equipment and the condition of phonograph styli. Also used to adjust pickup arm set down position and the tripping action of automatic record changers.

Test Prod

test set. A combination of instruments needed for making a particular combination of tests or for servicing a particular type of electrical equipment.

tetrode. A four-electrode vacuum tube.

thermal agitation. Random movements of free electrons which produce small pulses of current in a conductor. When this occurs in an input of a high-gain audio amplifier it produces noise in the output of the speaker.

thermal ammeter. See thermal instrument.

thermal flasher. An electric device that opens or closes a circuit automatically at regular intervals owing to alternate heating and cooling of a bimetallic strip heated by a resistance element.

thermal instrument. An instrument in which current is measured by sending it through a fine wire, which is thereby heated, and the resulting expansion or sag of the wire is used to deflect the meter pointer. Also called hot-wire instrument.

thermal relay. A relay actuated by the heating effect of current flow.

thermionic emission. The evaporation of electrons from a heated surface. Increase in temperature also accelerates evaporation of the cathode surface material, thus shortening cathode life.

thermionic tube. A vacuum tube in which the cathode is electrically heated.

thermionic voltmeter. A vacuum-tube voltmeter.

thermistor. A tiny resistance thermometer in which the active element is a semi-conductor having a large temperature coefficient of resistance. Among its applications is the measurement of microwave or infrared power.

thermocouple. A pair of dissimilar metals in contact forming a thermojunction at which a voltage is developed when the junction is heated.

thermocouple ammeter. A thermoammeter. An ammeter actuated by the voltage developed by a thermocouple. Used in measuring radio frequency currents.

thermogalvanometer. An instrument for measuring small high-frequency currents by their heating effect.

thermopile. A unit consisting of a number of thermocouples connected in series so as to increase the voltage sensitivity of the device.

thermo relay. A type of relay having a bi-metallic element which, when it reaches a certain temperature, operates relay contacts to make or break a circuit. In one type of thermo relay, the bi-metallic element is heated by an adjacent filament; in another type of thermo relay, the bi-metallic strip is heated by the current which it conducts.

thermostatic delay relay. A type of thermo relay which is preset or may be adjusted to make or break a circuit after a certain amount of time has elapsed.

third harmonic. A sine-wave component of a complex wave having three times the fundamental frequency.

thoriated emitter. A thoriated tungsten filament.

thoriated filament. A tungsten filament mixed with a small quantity of thorium for improved electron emission.

thorn needle. A type of soft playback point or phonograph needle such as a cactus or fiber needle.

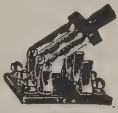
thread. The material removed from a phonograph disc by the recording stylus during recording. Also called chip.

three-gun picture tube. A color television picture tube enclosing three electron guns, one for each primary color (blue, green and red in color TV). Each gun is controlled by its own primary color signal.

three-phase current. Current delivered through three wires, with each wire serving as the return for the other two and with the three current components differing in phase successively by one-third cycle or 120 electrical degrees.

three-phase three-wire system. An alternating-current supply system comprising three conductors over which three phase power is sent. A four-wire system, which includes a ground, is sometimes used in local installations.

three-pole switch. An arrangement of three single-pole switches coupled together to operate three contacts simultaneously.


Three-Pole Switch

three-way speaker. A type of high-fidelity loudspeaker employing a woofer, mid-range reproducer, and tweeter as a single integrated unit. A dividing network is used to channel the bass, middle-range, and treble tones to the appropriate section of the speaker.

three-wire system. A direct-current or single-phase alternating-current system comprising three conductors, one of which (the neutral wire) is maintained at a potential mid-way between the potential of the other two.

threshold of audibility. Also called threshold of hearing. At 1000 cycles the threshold is at a power level of 10^{-16} watts/cm^2 (effective alternating value of sound pressure, 2×10^{-4} dynes/cm^2). From this zero level the threshold at lower frequencies increases to +62 db at 25 cycles. At higher frequencies the value drops to a minimum of −8 db at 4000 cycles, then increases to +20 db at 16,000 cycles, beyond which the value rises abruptly.

threshold of feeling. The loudness level at which sound at a particular frequency can just be felt. About +120 db. Sometimes called threshold of pain. At this level, eardrums may rupture.

threshold of hearing. The threshold of audibility.

throat. That end of a horn having the smaller cross-sectional area.

throat microphone. A contact microphone that is strapped to the throat, and operates by throat vibrations.

throw-out spiral. A blank spiral groove of large pitch at the end of a phonograph record, provided to actuate the record-changing mechanism of a record changer.

thump. Same as a telegraph key click. A colloquialism.

thyratron. A hot-cathode grid-controlled gas-discharge tube.

tickler. A small coil connected in series with a vacuum tube plate circuit and inductively coupled to the grid circuit to provide feedback. Used in regenerative circuits.

tie-down-point. 1. One of the frequencies at which a radio receiver is aligned, generally for the broadcast band at 600 and 1400 kc. 2. A point in the chassis where several common connections are made to a single terminal or solder lug. Also called a tie point.

tight coupling. Closest possible coupling between two radio or audio frequency circuits.

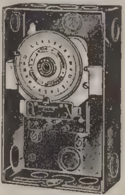
time constant. A concept of use in the production of distorted wave forms such as square or saw-tooth voltages. In a capacitive circuit the product of C (farads) times R (ohms) gives the time (seconds) to charge or discharge a capacitor to the extent of 63%. In an inductive circuit the ratio L (henries) divided by R (ohms) gives the time (seconds) for current to charge 63% of the total value. The voltage or current rates of charge are not uniform. In the time at which the process is 63% complete, charge would have been complete if it had continued at the initial rate.

time-delay circuit. A circuit that delays the transmission of an impulse a definite desired period of time.

time-delay relay. A relay in which the energizing or de-energizing of the coil precedes movement of the armature by an appreciable and generally determinable interval.

time lag. The time interval between two phenomena.

time signals. One of the technical radio broadcast services of the National Bureau of Standards radio station WWV, at Washington, DC. Time announcements are made at 5-minute intervals. Eight carrier frequencies are used; modulating frequencies for time signals are 440 and 600 cycles, transmitted alternately. These signals are used by armed forces installations, ships at sea, industry, jewelers and other persons for setting timepieces. They are transmitted by International Morse Code and radiotelephone. See WWV.


Time Switch

time switch. A clock-controlled switch. A timer.

timing axis oscillator. An oscillator circuit that generates a saw-tooth voltage for the horizontal deflecting plates or horizontal deflecting coils of a cathode-ray tube, or oscilloscope.

tinned wire. Copper wire that has been coated with a layer of tin or solder to simplify soldering.

tinsel cord. A highly flexible cord in which the conductor is composed of strips of thin metal foil, or tinsel wound around a strong but flexible central insulating cord.

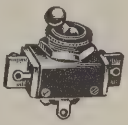
tip. The contact at the end of a plug.

tip jack. A small single-hole jack into which a single pin contact plug or tip is inserted to make an electrical connection.

Tip Jack

T-network. A network composed of three impedance branches connected two in series with one side of a line, the third across the line between the other two.

toggle switch. A small snap switch that is operated by a projecting lever.


Toggle Switch

tolerance. The permissible variation from rated or assigned value.

tone. The general character of reproduced sound as it affects the human ear.

tone arm. In a record player, phonograph, or changer, the arm which contains the cartridge and stylus. See phonograph pickup.

tone control. A device provided in electronic sound equipment to alter the proportion of bass and treble frequency response.

tone generator. An audio frequency signal generator.

tone-modulated waves. Continuous waves modulated at a single audio frequency.

top cap. A metal cap placed on the top of some vacuum tubes and connected to one of the electrodes, usually the control grid, in receiving tubes, and the plate in transmitting tubes.

toroid. A ring. A doughnut-shaped coil such as is formed by bringing together the ends of a solenoid.

tower. A tall metal structure used to support an antenna, or which itself is the antenna.

T-pad. A special type of potentiometer with particular application in audio amplifiers and sound equipment. Used primarily as an attenuator. Input and output impedances are equal. A T-network.

TR switch. Abbreviation for an electronic antenna switch. A type of switch often used when the same antenna serves for both transmission and reception. When transmitting, the switch electronically connects the antenna to the transmitter. When transmission stops, the switch instantly connects the antenna to the receiver.

trace. The path followed by the spot as it is in motion across the screen of a cathode-ray tube.

tracer. A thread of contrasting color in wire insulation which aids in identification and tracing of the wire during maintenance and servicing of cables. A circuit-tracing aid.

tracking. 1. The condition in which all tuned circuits accurately follow the frequency indicated by the tuning dial over the entire tuning range. 2. The path of a phonograph pickup stylus in following record grooves. 3. In radar, the accuracy with which the radar antenna (or a gun controlled by it) follows the target.

tracking pressure. See stylus pressure.

transceiver. A combination of radio transmitting and receiving equipment in a single housing, in which some or all of the vacuum-tube stages and circuit components are used jointly for both transmitting and receiving, by employment of suitable switching arrangements.

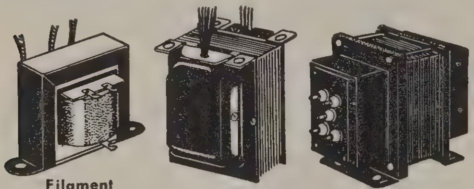
transconductance. Mutual conductance. A conductance (I/E) relating input and output. Also the small change in plate current which results from a small change in grid voltage. Transconductance is equal to the amplification factor of a tube divided by the plate resistance.

transcribe. To record a radio program (on disc, tape or wire, etc.) for re-broadcasting at a later time.

transcription. Any recording of a complete program, as contrasted with a phonograph record which ordinarily contains only a single musical selection. Transcriptions are made to permit broadcasting of a particular program at any desired time by any number of stations. Discs usually run to 16″ in diameter and are recorded at 33⅓ rpm.

transducer. 1. Generally, a device which converts energy from one form into another, always retaining the characteristic amplitude variations of the energy being converted. Examples: A microphone, which converts acoustical energy into electrical energy; a loudspeaker, which does the reverse; a photocell, which converts light energy into electrical energy; a phonograph pickup, which converts mechanical energy into electrical energy. 2. A device which transfers energy from one circuit to another, without changing the form of the energy. Example, a transformer.

transformer. An electrical device, without moving parts, that transfers electrical energy by electromagnetic induction from one or more circuits to one or more other circuits. May be used to step up or down voltage. Does not effect frequency. Transferred energy remains constant except for the inherent copper wire and coil losses. Consists essentially of one or more coils inductively coupled. For power or audio transformers, iron cores are used. In RF, either air or powdered iron cores are employed.


Filament or Output **Power** **Plate**

Types of Transformers

transfer admittance. The transfer admittance, Y_{ab}, between two meshes, a and b, is the ratio of the current in a to the voltage in b when all generators except that in b are replaced by their internal impedances. If there are no unidirectional impedances involved, Y_{ab} is equal to Y_{ba}.

transfer characteristics. The family of curves for various values of plate voltage in which plate current is plotted as a function of control grid voltage.

transformer-coupled amplifier. An audio amplifier employing untuned iron core transformers; often used in output coupling, less frequently in input or interstage coupling. Also an IF or RF amplifier using tuned air or powdered iron core transformers for coupling between stages.

transformer oil. A high-quality insulating oil in which windings of large power transformers are immersed for cooling and insulation, and to prevent oxidation.

transient. A temporary component of current existing in a circuit during adjustment to a changed load, different source voltage, or line impulse.

transient oscillation. A momentary oscillation occurring in a circuit during switching.

transient response. In high-fidelity, the ability of an amplifier or loudspeaker to reproduce faithfully the extremely abrupt beginnings and endings of sounds. More generally, the performance of any system when subjected to a sudden change in its input signal.

transistor. A tiny device used for audio and RF amplification, conversion, and related applications otherwise performed by vacuum tubes. Transistors consume extremely little power and require no heater voltage. They are made of germanium or silicon with impurities added, so that one portion is deficient in electrons (P material), and one portion has excess electrons (N material). When the N material is "sandwiched" between the P material (or vice versa), the transistor is of the junction type; when the N material is located at the tip of tiny contact points on the P material (or vice versa), the transistor is of the point-contact type.

Transistors

transistor battery. A type of miniature battery designed specifically to supply power for transistor circuits.

transition frequency. In sound recording, the change-over frequency from constant-amplitude recording (at lower audio frequencies) to constant-velocity recording (at higher audio frequencies).

transitron oscillator. A negative resistance pentode oscillator in which the screen and suppressor grids are capacitively coupled. The screen grid is more positive than the plate. Oscillations occur as the suppressor grid periodically divides the current between screen grid and plate.

transit time. The time required for an electron to travel from one electrode to another in a vacuum tube.

transmission. Transfer of electric energy from one location to another through conductors or by radiation or induction fields. The transfer always is accompanied by energy loss, which is inversely proportional to the efficiency of the medium through which transmission occurs. Radio communication is possible in spite of excessive energy losses because of exceptionally high sensitivity of the receiving equipment.

transmission line. A set of conductors used to transfer signal energy from one location to another, or to transmit electrical energy over long distances for power purposes.

transmission loss. A term used to denote a decrease or loss in power during the transmission of energy from one point to another. Usually expressed in decibels.

transmission primaries. In color TV, three basic signals into which the total video information is divided. These signals consist of the Y (luminance), I, and Q signals. The Y signal is the same as a monochrome signal and is separated from the other color signals to permit reception of a color program on a black and white TV receiver, thus fulfilling compatibility requirements. The I color signal components are transmitted on a bandwidth of 0–1.5 mc. The Q signal requires a bandwidth of only 0–.5 mc. Fine picture detail, represented by frequency components from 1.5–4.2 mc, are transmitted only by the Y monochrome signal. In this frequency range the eye is not sensitive to chrominance or color, so chrominance above 1.5 mc. is not necessary.

transmitter. 1. A comprehensive term applying to all of the equipment used for generating and amplifying an r.f. carrier signal, modulating this carrier with intelligence, and radiating the modulated r.f. carrier into space after it is amplified additionally and fed to the transmitting antenna. 2. In telephony, the microphone that converts sound waves into electrical energy varying at audio frequency rate. 3. The generator unit of a synchro system, commonly known as a "master" which controls the "slave."

transposition. Interchanging the relative positions of wires to neutralize the effects of induction to or from other circuits or, in two-wire parallel lead-ins for an antenna, to minimize radiation from the lead-in during transmission and to minimize interference pickup by the lead-in during reception.

transverse waves. Waves in which the periodic amplitude varies in a direction at right angles to the direction of propagation. A wave along a stretched rope is transverse, the points in the rope moving sideways. Similarly, with a violin string. Electromagnetic radiation behaves like a transverse wave motion in which electric amplitude generates magnetic amplitudes at right angles; and these, in turn, generate new electric amplitudes. Both effects, however, are at right angles to the direction in which the wave is traveling.

trap. Tuned circuit used to eliminate a given signal or to keep it out of a given circuit. In television receivers, traps in the video circuits keep the sound signal out of picture channels. A common type of trap is simply a tuned circuit which absorbs the energy of the signal to be eliminated.

traveling-wave tube. An electron tube of special design in which a beam of electrons interacts continuously with a guided electromagnetic wave to produce amplification at ultra-high and microwave frequencies.

treble. The higher audio frequencies. The higher audible tones.

trf. Abbreviation for tuned radio frequency.

triad. A triangular group of three primary color phosphor dots. Many such groups form the color mosaic on the viewing screen of a color TV picture tube.

triboelectric. Pertaining to electricity generated by friction.

trichromatic coefficients. In color TV, the three coordinate values, two of which describe a color by its position in a chromaticity diagram.

trickle charge. The continuous charging of a storage battery at a low rate (approximately equal to the internal losses) to maintain the battery in a fully charged condition.

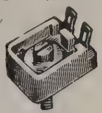
trickle charger. A device designed to charge a storage battery at a low rate continuously to keep it fully charged.

trigger action. Initiation of main current flow instantaneously by a weak controlling impulse in a device.

trigger circuit. A multivibrator circuit in which either of the two tubes can operate stably, but the firing of either tube extinguishes the other. The "flip-flop" action is produced by a trigger pulse in the grid of both tubes. Modifications make possible the use of positive or negative triggering, a double flip-flop or one shot operation. Used in radar and counting circuits.

trigonometric functions. Useful expressions for ratios of lengths of sides of triangles. Given X, Y axes and a line which can rotate about the origin to form angles with the +X axis: drop a perpendicular from the line to the X axis (+ or −). Its length is y. The X distance cut off is x; the line segment is r. r is always +; x or y may be

+ or −. The angle at the origin is α. The ratio of any two sides is a number which varies with α. Sine α is simply y/r. Cosine α is x/r. Tangent α is y/x. The reciprocals of these are cosecant α, secant α, and cotangent α, and are less often used. Values of the functions from 0° to 90° are found in trigonometric tables. Larger angles are referred to those in the first quadrant with proper sign. Thus, tangent 315° (45° less than 360°) is the same as tangent 45° (1.00) except that, since y is negative, that value of tangent 315° also is negative, and is −1.00. Similarly, cosine 150° (30° less than 180°) is −0.5.


Trimmer Capacitor

trimmer capacitor. A small semi-adjustable capacitor, usually adjusted with a screwdriver, and used in the tuning circuits of radio receivers and other radio apparatus. It permits fine adjustment of capacity of the tuned circuit, for accurate alignment.

triode. A three-electrode vacuum tube, usually having a cathode, control grid and anode.

triode-pentode. A vacuum tube having a triode and a pentode in the same envelope.

tripping device. Any mechanical or electromagnetic device used to open a circuit breaker or starter, either when certain abnormal electrical conditions occur or when a catch is actuated manually.

tristimulus values. The amounts of primary colors necessary to match a given color.

tri-tet oscillator. A crystal-controlled vacuum-tube oscillator circuit in which the plate circuit is tuned to a harmonic of the crystal fundamental and a resonant cathode circuit is tuned to the crystal fundamental. Isolation between the two circuits is obtained through the use of a screen grid which operates as the "plate" for the crystal oscillator section. The tri-tet oscillator is a strong generator of harmonics of the crystal frequency.

tropospheric bending. A refraction of radio waves caused when they strike adjacent layers of air masses having different temperature and humidity characteristics. VHF (very high frequency) radio waves are more affected by this type of refraction than are lower frequency waves. The lower the frequency of radio waves, the less is the likelihood of tropospheric bending. Tropospheric bending accounts for the unusually long distances sometimes covered by VHF signals.

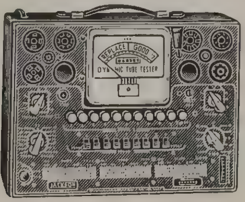
trunnion. A cylindrical support for a bearing, used in some crystal phonograph pickups.

tube. A device which produces amplification, oscillation, rectification, or other useful results by controlling the flow of electrons in a circuit external to the tube, and through a vacuum, gas or vapor inside the tube.

tube coefficients. The characteristic constants of a thermionic vacuum tube: amplification factor, transconductance and plate resistance.

tube factor bridges. Bridge circuits adapted to the measurement of the dynamic characteristics of tubes, interelectrode capacitance or negative resistance. A single bridge may be used to obtain several of these values, such as all of the tube coefficients.

tube noise. Noise originating within a vacuum tube; such as microphonics and "shot-effects."

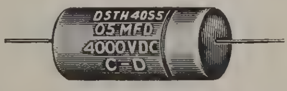


Tube Tester

tube tester. An instrument which indicates the condition of vacuum tubes.

tube voltage drop. In a tube, the potential difference between anode and cathode.

tube voltmeter. A vacuum tube voltmeter. Abbreviated VTVM. See vacuum tube voltmeter.



Tubular Capacitor

tubular capacitor. A paper or electrolytic capacitor having the form of a cylinder, with leads projecting axially from one or both ends.

tuned antenna. An antenna designed to provide resonance at the desired operating frequency by means of its own inductance and capacitance.

tuned circuit. An inductance-capacitance circuit that may be adjusted to resonance at a desired frequency.

tuned filter. An arrangement of electronic components tuned either to attenuate or pass signals at its resonant frequency.

tuned-grid-tuned-plate oscillator. A type of self-excited vacuum-tube oscillator having grid and plate circuits which are tuned to resonance. Maximum oscillation depends upon maximum feedback, which occurs when the grid and plate circuits are tuned to resonance.

tuned radio-frequency amplifier. A narrow-band amplifier employing vacuum tubes and tuned circuits for the purpose of amplifying radio-frequency energy.

tuned radio-frequency receiver. A radio receiver consisting of a number of vacuum-tube radio frequency amplifier stages that are tuned to resonance at the carrier frequency of the desired signal by means of a gang-tuned capacitor. The amplified signal at the original carrier frequency is fed directly into the detector for demodulation. It preceded the superheterodyne receiver in the development of the modern radio receiver. Often abbreviated TRF receiver.

tuned radio-frequency stage. A stage of amplification which is tunable to the radio frequency of the signal being received.

tuned-reed frequency meter. A vibrating-reed instrument for measuring the frequency of alternating current in power lines and circuits. See Frahm frequency meter.

tuner. A device for the reception of AM, FM, or both, usually in high-fidelity systems. It is essentially the same as an AM or FM radio, except that it does not include an audio power output stage, or a speaker.

Tuner

Tungar Bulb

Tungar bulb. A phanotron (hot-cathode gas-discharge rectifier tube) having a heated filament serving as cathode and a graphite disc serving as anode in an argon-filled glass envelope. Used chiefly in battery chargers. Also called Tungar tube.

tungsten. A highly emissive metal used for filaments and other electrodes of vacuum tubes, for the target in X-ray tubes, for electrodes of spark gaps, and for contacts of relays.

tungsten filament. A filament used in incandescent lamps, in thermionic vacuum tubes and other tubes requiring an incandescent cathode.

tuning. 1. Adjusting the inductance or capacitance (or both) in a coil-capacitor circuit. 2. Adjusting all circuits in electronic equipment for optimum performance.

tuning coil. A variable inductor.

tuning capacitor. A variable capacitor.

tuning control. The control knob that adjusts tuned circuits.

tuning eye. Popular name for a cathode-ray tuning indicator.

tuning indicator. Any device which indicates when a radio receiver is tuned accurately to a radio station.

tuning inductor. A variable inductor used for tuning.

tuning meter. A direct-current meter connected to a radio-receiver circuit for use in determining when the receiver is accurately tuned to a desired frequency or signal.

tuning stub. Usually, a piece of twin lead or coax, connected to a line and shorted at its free end. Widely used in impedance matching.

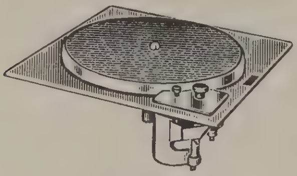
Tuning Wand

tuning wand. A rod of insulating material having a brass plug at one end and a powdered iron core at the other end. Used for checking receiver alignment by insertion of one end into a coil.

turnover cartridge. A phonograph cartridge for playing both standard and microgroove records. Consists of a single cartridge with a standard and microgroove stylus and a mechanism which permits pivoting the cartridge so that the proper stylus contacts the record groove. Some turnover cartridges consist of two independent cartridges mounted back-to-back; one cartridge has a stylus for microgroove records and the other has a stylus for standard records.

turns ratio. The ratio of the number of turns in a secondary winding of a transformer to the number of turns in the primary winding.

turnstile antenna. An ultrahigh-frequency antenna system consisting of two halfwave dipoles at right angles to each other and crossing at their centers, fed with currents that are 90 degrees out of phase.



Record Turntable

turntable. The electric or spring motor-driven disc on which the record is placed in a phonograph, record player, or sound recorder.

turret. 1. A revolving plate sometimes mounted at the front of a television camera and carrying two or more lenses of different types, used to permit rapid interchange of lenses. 2. A rotatable device on which one or more pre-tuned circuits are mounted for use in all-wave receivers and transmitters. Rotating the device connects a different pre-tuned circuit into the receiver circuit and disconnects those removed from the receiver circuit.

TVI. Abbreviation for television interference. Used by Amateurs to denote interference by their transmitters with reception of picture or sound on television receivers.

tweeter. Speaker designed specifically for the reproduction of treble frequencies. Tweeters are employed in coaxial speakers and in multi-unit speaker systems.

twin line. A type of transmission line which has a solid insulating material, in which the two conductors are placed parallel to each other and whose impedance is determined by the diameter and spacing of the conductors and the insulating material. Several different impedance values are in common use (75, 150 and 300 ohms). Also known as twin lead.

twin-triode. Two triode vacuum tubes in a single envelope.

Twisted Pair

twisted pair. A cable composed of two insulated conductors twisted together either with or without a common covering.

twister. A piezoelectric crystal of such shape that a small voltage is generated when the crystal is subjected to torsional mechanical stress.

two-phase current. Current delivered through two pairs of wires (or a three-wire system to a single load) with a phase difference of one-quarter cycle or 90 degrees between the currents in the two pairs. Commonly called quarter phase.

two-way communication. Communication between radio stations, each of which have transmitting and receiving equipment. Type A waves: Continuous waves. Type A1 waves: Unmodulated keyed continuous waves. Type A2 waves: Modulated keyed continuous waves. Type A3 waves: Continuous waves modulated by music, speech, etc. Type A4 waves: Super-audio-frequency modulated continuous waves as used in facsimile systems. Type A5 waves: Super-audio-frequency modulated continuous waves as used in television. Type B facsimile: A system of communication where images are built up of lines and dots of varying intensity. Type B waves: Keyed damped waves.

two-way switch. A switch used for controlling electrical or electronic equipment components or circuits from either of two positions.

two-wire line. An electrical transmission line formed by two conductors insulated from each other.

type-printing telegraphy. Telegraphy in which the message is automatically printed at the receiving station.

U

UHF. Abbreviation for ultra-high frequency.

UHF converter. Ultra-high-frequency converter. An electronic circuit which converts UHF signals to a lower (intermediate) frequency. UHF converters are used to convert UHF television signals to VHF in order to permit UHF reception on VHF television receivers. Also used in communication work to permit UHF reception on lower-frequency receivers.

ultradyne reception. A form of superheterodyne reception in which the intermediate-frequency signal is obtained from auxiliary oscillations superimposed on the plate circuit of the first vacuum tube.

ultrafax. A communications system utilizing radio, facsimile and television methods for transmitting printed information.

ultra-high frequency. A Federal Communications Commission designation for the frequency band from 300 to 3,000 mc. In television, channels 14 to 83, or 470 to 890 mc.

ultra-high-frequency generator. A device for generating extremely high-frequency alternating currents. The four main types are: (1) conventional negative-grid generators; (2) positive-grid or Barkhausen generators; (3) magnetrons; (4) velocity-modulated, or electron-beam generators, such as the klystron.

ultra-linear amplifier. A type of high-fidelity amplifier which requires the use of a special type of output transformer providing partial screen loading. It is characterized by high power output and low distortion.

ultra-short waves. A general term applying to radio waves above 30 mc in frequency. Waves shorter than 300 mc are usually called microwaves.

ultrasonics. The field of physics dealing with the production, reception, detection, absorption, examination and application of acoustic waves of 20 kc frequency and above. At present these extend into the megacycle region.

ultraudion oscillator. A variation of the Colpitts oscillator circuit.

ultraviolet. A range of invisible radiation frequencies beyond the visible spectrum at the violet, or high-frequency end, and extending into the region of low-frequency X-rays.

ultraviolet rays. Rays of ultraviolet radiation.

umbrella antenna. An antenna in which the wires are guyed downward in all directions from a central mast or tower to the ground, somewhat like the ribs of an open umbrella.

unbalanced line. An RF transmission line in which the voltages on the two conductors are unequal with respect to ground; e.g., a coaxial line.

undamped oscillations. Oscillations of an electromagnetic wave whose energy source constantly restores losses incurred by the load or radiation; may be constant or varying (modulated), and are characterized, generally, by sine-wave form (positive and negative peaks of the same amplitude).

undamped wave. A continuous wave with undamped oscillations.

undercutting. Cutting too shallow a groove or cutting with insufficient lateral movement of the stylus during sound recording.

underload relay. A relay that operates when the load in a circuit drops below a minimum value.

undermodulation. Incomplete modulation at a transmitter.

undistorted wave. A periodic wave in which both the attenuation and velocity of propagation are the same for all frequency components as they propagate from the input to the output of a system.

unidirectional antenna. An antenna designed to radiate with maximum strength or receive with maximum sensitivity in a particular direction and with minimum radiation or reception in the opposite direction.

unidirectional current. A current that flows in the same direction at all times. If it is essentially of a constant value, it is called direct current.

unidirectional microphone. A microphone that picks up sounds entering it at the front, but is "dead" to sounds entering at the sides or back.

uniform line. A transmission line that has identical electrical properties throughout its length.

unilateral conductivity. Conductivity in only one direction, as in a perfect rectifier.

uniphase. A single-phase alternating current.

unipotential cathode. A cathode to which heat is supplied by an independent heater element. Also called an indirectly heated cathode or equipotential cathode.

unit pole. Unit of measurement of magnetic strength. A unit pole repels a similar pole with a force of one dyne at a distance of one centimeter in a vacuum.

unity coupling. Perfect magnetic coupling between two coils, so that all the magnetic flux produced by the primary winding passes through the entire secondary winding.

unity power factor. A power factor of 1.0, obtained when current and voltage are in phase, as in a circuit containing only resistance or in a reactive circuit at resonance.

universal motor. A series-wound motor that may be operated at approximately the same speed and output on either direct current or single-phase alternating current.

universal output transformer. An output transformer having a number of taps on its winding to permit its use between the audio-frequency output stage and the loudspeaker of practically any radio receiver or amplifier by proper choice of connections.

universal receiver. An AC-DC radio receiver. It may be operated either from alternating-current or direct-current power lines without changes in internal connections. It has no power transformer.

universal shunt. See Ayrton shunt.

unmodulated. Without modulation. The RF carrier signal alone, as it exists during pauses between station programs.

unmodulated groove. A silent groove on a recording; a groove cut without sound.

unmodulated keyed continuous waves. Continuous waves that are interrupted for signaling purposes by changes in either amplitude or frequency. Conventional radiotelegraphy depends upon abrupt change from zero to maximum amplitude in the wave, the frequency being unaffected by the coding. High-speed commercial radiotelegraphy often uses a system in which amplitude remains constant and frequency shifts abruptly by an amount in the order of several thousand cycles, the intelligence being made apparent by the high selectivity of the receiving equipment which is tuned only to the coding frequency. This system is known as Frequency Shift Keying, or FSK.

untuned. Not resonant at any of the frequencies being used.

V

V. Letter used on diagrams to designate a voltmeter.

v. Abbreviation for volt.

va. Abbreviation for volt-ampere.

vacuum. An enclosed space from which practically all air has been removed. (*Note:* A perfect vacuum is not attainable.)

vacuum capacitor. A type of capacitor having tubular elements which are housed in an evacuated glass envelope. Vacuum capacitors are characterized by their extremely low inductance and extremely high breakdown voltage.

vacuum switch. A switch enclosed in an evacuated bulb.

vacuum tube. An evacuated enclosure including two or more electrodes between which conduction of electricity through the vacuum may take place. A general term used for all electronic tubes.

vacuum-tube keyer. A circuit in which a biased vacuum tube is used to control the keying of a radio transmitter. When the radio-telegraph key is pressed, bias voltage is removed from the control grid of the keyer tube, permitting current to flow in the transmitter keying circuit.

vacuum-tube oscillator. A vacuum tube circuit or device employed to convert direct current power into alternating current power at a desired frequency.

vacuum-tube transmitter. A radio transmitter employing vacuum tubes to convert electric power into radio-frequency power.

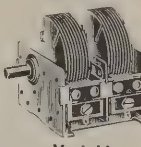
Vacuum-Tube Voltmeter

vacuum-tube voltmeter. A test instrument which utilizes the high input impedance of a vacuum tube for measuring voltages without affecting the circuit to which the instrument is connected.

valve. The term used in the British Commonwealth to designate a radio tube.

V antenna. A long linear radiating conductor laid out in the form of a V, and generally used for long distance transmission or reception in the radio spectrum below 5000 kc. It has directional properties.

variable-capacitance cartridge. A type of phonograph cartridge. Also called FM cartridge. To utilize the output of the variable capacitance cartridge an oscillator and FM detector unit are required. The stylus of the variable capacitance cartridge is mechanically coupled to one of two plates in the cartridge. Thus, as the record disc revolves, the stylus which comes in contact with the record grooves vibrates in accordance with the sound represented by the grooves and causes the plate to which the stylus is connected to vibrate in a like manner. Since one of the plates in the cartridge vibrates, there is a constantly changing capacitance between it and the other plate. These capacitance changes are utilized by connecting the cartridge to an oscillator. The capacitance changes frequency modulate the oscillator and the output signal of the oscillator is then converted to audio voltage by the detector. This audio voltage is ready for amplification and transformation to audible sound. This type of cartridge is characterized by extremely light weight and excellent stylus compliance. These two characteristics result in minimum record wear as well as unusually wide frequency response. The variable capacitance cartridge is a constant-amplitude device, *i.e.*, the greater the amount (not frequency) of stylus movement, the greater is the output voltage.



Variable Capacitor

variable capacitor. A capacitor whose capacity may be changed either by varying the space between plates (as in a trimmer capacitor) or by varying the amount of meshing between the two sets of plates (as in a tuning capacitor).

variable coupling. Inductive coupling of two or more coils which can be varied by moving one or more in relation to the others.

variable-frequency oscillator. An oscillator whose frequency can be varied over a given range. Abbreviated VFO.

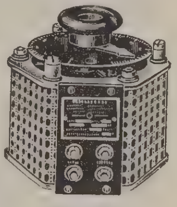
variable-impedance tube. See reactance tube.

variable-mu tube. A super-control or remote cutoff tube. A vacuum tube with a grid designed so that the amplification factor and the mutual conductance are variable by the grid-bias voltage value.

variable-reluctance cartridge. A type of magnetic phonograph cartridge. See magnetic cartridge.

variable resistance. A resistor having a sliding contact so that its resistance value can be changed.

variable-speed scanning. A scanning method whereby the speed of deflection of the scanning beam in the cathode-ray tube of a television camera is governed by the optical density of the film being scanned. The beam in the receiving cathode-ray tube has constant intensity but moves in synchronism with the transmitting beam through interconnection of deflecting circuits. This reproduces the original picture since the apparent illumination of the screen depends on the speed of the beam.



Variable Transformer

variable transformer. An iron-core auto-transformer, the output voltage of which can be varied continuously over a range from zero to maximum.

variocoupler. A radio-frequency transformer having provisions for varying the coupling between the two windings, usually by sliding one within the other.

variometer. A variable inductance having two coils in series, one mounted inside the other, with provisions for rotating the inner coil in order to vary the total inductance of the unit over a wide range.

varistor. A resistor whose value varies with the instantaneous value of current or voltage applied to its terminals. Useful for modulation of a carrier wave.

vector. A quantity having magnitude and direction. Graphically represented by an arrow. Length of the vector represents magnitude of the quantity to scale. Direction of the arrow indicates the direction or angle of the quantity. Vectors are added graphically by placing them tail to tip and connecting tail of the first with tip of the last to form a new vector called the resultant. Subtraction is accomplished by addition of the negative of a vector (one turned tail to tip).

vector diagram. In AC theory, a polar diagram in which voltages, currents or impedances are sprouted out from the center or origin at their proper phase angles. They are then combined according to the laws of vector addition.

velocity microphone. See ribbon microphone.

velocity-modulated tube. A type of inductive-output tube in which the electron stream is modulated in velocity and may induce oscillatory energy in the output. Klystrons are typical of this class of tubes.

velocity modulation. A type of modulation characterized by modification of the velocity of electrons in a beam. Most frequently the term implies that variations in electron velocity are used to convert DC beam energy into RF energy.

vernier. An auxiliary scale of slightly smaller divisions than the main measuring scale, by means of which measurements may be made with greater precision than allowed by the main scale. Thus any device, control, or scale used to obtain fine adjustment or more accurate measurement.

vernier capacitor. A small variable capacitor shunt-connected with a larger tuning capacitor to provide a finer adjustment

vernier dial. A tuning dial in which each complete rotation of the control knob causes only a fraction of a revolution of the main shaft, permitting accurate adjustment.

vertical antenna. A vertical steel tower, metal rod, or suspended wire used as an antenna.

vertical blanking pulse. In television, a pulse transmitted at the end of each field to cut off the cathode-ray beam while it is returning to start the next field.

vertical centering control. A control provided in a television receiver or cathode-ray oscilloscope to shift the position of the entire image vertically on the screen.

vertical convergence control. In color TV, a control which adjusts the amount of vertical dynamic convergence voltage.

vertical convergence shape control. In a three-gun color picture tube receiver, a variable resistor in the convergence amplifier which adjusts the shape of the vertical convergence voltage.

vertical deflecting electrodes. The pair of electrodes that serves to move the electron beam up and down on the fluorescent screen of a cathode-ray tube employing electrostatic deflection.

vertical dynamic convergence. In color TV, voltages added to the steady convergence voltage to keep the spot in register at the shadow mask.

vertical dynamic focus. In color TV, voltage added to the focus control circuit to keep the spot in focus.

vertical hold control. The device that changes the frequency of the vertical sweep oscillator in a television receiver.

vertical linearity control. Controls the height (upper half) of the screen of a television picture tube. Usually mounted on the back of the television receiver.

vertical-incidence transmission. The radiation of a radio wave vertically to the ionosphere and back.

vertically polarized wave. A wave whose direction of electrical polarization is perpendicular to the earth.

vertical polarization. The condition in which radio waves are transmitted with their plane of electrical polarization initially perpendicular to the surface of the earth.

vertical radiator. A conductor or system of conductors positioned perpendicular with respect to the earth and used as an antenna for transmitting or receiving.

vertical recording. A phonograph recording in which the sound grooves move up and down rather than from side to side. Also called hill-and-dale recording.

vertical resolution. On a television image test pattern, the number of horizontal wedge lines that can be clearly discerned by the eye before they merge together.

vertical retrace. The return of the spot from the bottom of the image to the top after each vertical sweep.

vertical sweep. In television, downward movement of the scanning beam from top to bottom of the picture being televised.

very high frequencies. A band of frequencies in the radio spectrum extending from 30 to 300 mc. In television, channels 2-13, or 54-216 mc.

very low frequencies. A band of frequencies in the radio spectrum extending from 10 to 30 kilocycles.

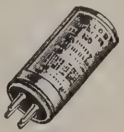
vestigial sideband. Any amplitude-modulated wave in which one sideband is greatly attentuated, having a gradual cutoff near the carrier frequency. The other sideband is transmitted without substantial attenuation.

VFO. Abbreviation for variable frequency oscillator.

VHF. Abbreviation for very high frequency.

vibration pickup. A microphone designed to respond to mechanical vibrations rather than to sound waves.

vibrator. An electromagnetic device which converts a DC voltage to pulsating DC or AC. It is used in the power packs of auto radios and some public address amplifiers to convert the 6-volt auto storage battery voltage to a low AC voltage. The AC voltage is then stepped up by a power transformer, and converted into a high DC voltage either by a conventional rectifier tube circuit or by an extra set of contacts on the vibrator itself.



Vibrator

vibrograph. An apparatus for recording mechanical vibrations.

video. Latin word for "I see." Applied as a prefix to the name of television parts or circuits which carry picture signals.

video amplifier. A stage in a television circuit which amplifies video frequencies after demodulation.

video detector. In television, the demodulator circuit which extracts the picture information from the modulated carrier.

video frequencies. Frequencies existing in the demodulated output of a television camera as a result of scanning the image being transmitted. The range is from almost zero to well over 4 mc. Also called visual frequencies.

video-frequency amplifier. In television an arrangement of one or more vacuum-tube stages which will amplify the entire range of video frequencies. Used in a receiver or in the television camera output.

video signal. The picture signal in a television system.

viewing screen. 1. The layer of phosphor which converts the energy of the electrons of the beam of a cathode-ray tube into visible radiation. 2. The translucent or opaque screen or surface upon which the image reproduction of a projection-type television receiver is cast.

vinylite. A translucent plastic with a vinyl resin base, used in the pressing of phonograph records when absence of needle scratch is preferable to long life. Frequently, the record is tinted in various shadings of red, green, blue, etc.

virtual cathode. A surface of minimum potential surrounding a cathode due to space charge. An electron arriving at a point on the cathode side of this minimum without velocity will return toward the cathode. A similar electron on the plate side will travel toward the plate. Thus the virtual cathode serves as the source of emission. A grid may be conceived of as a means of producing a similar but readily controlled potential minimum without recourse to space charge.

viscometer. An electronic device for measuring the degree to which a liquid resists a change in shape.

viscous-damped arm. A phonograph pickup arm mounted on a liquid cushion of oil. The viscosity of this liquid cushion provides high damping to eliminate arm resonances. Viscous-damped arms also protect the record groove and stylus, since the arm, if released, does not instantly drop to the record, but "floats" down gently.

visible radiation. Radiation corresponding to the visible spectrum of light. Roughly 4000 to 7000 Angstrom units.

visual frequencies. Video frequencies.

visual transmitter. The equipment used for the transmission of the visual (picture) signal only from a television broadcast station.

vitreous. Having the nature of glass.

VLF. Abbreviation for very low frequency.

voice coil. The moving coil that is attached to and activates the diaphragm or cone of a dynamic loudspeaker.

voice frequency. The essential frequency range of ordinary speech, from about 100 to 2,000 cycles.

volt. The practical unit of voltage, potential or electromotive force. One volt is the electromotive force which will send one ampere through a resistance of one ohm.

voltage. The electrical pressure that makes current flow through a conductor. Same as *electromotive force.*

voltage amplifier. A vacuum tube amplifier stage for raising the voltage level of a signal without regard to power. Ordinarily all but the output stage of the amplifier.

Voltage Divider

voltage divider. A resistor having one or more fixed or adjustable contacts along the length of its resistance element, in addition to the customary two end terminals. The total available voltage is applied between the two end terminals, and desired portions of this voltage are obtained from any two terminals on the voltage divider.

voltage doubler. A transformerless rectifier circuit that provides double the output voltage of a conventional vacuum tube rectifier by charging a capacitor during one half-cycle and discharging it in series with the output voltage of a similar unit in the full wave version, during the next half-cycle. Similar circuits have been designed for trebling or quadrupling voltage.

voltage drop. The voltage developed between the terminals of a circuit component by the flow of current through the resistance or impedance of that part.

voltage feed. Excitation of a transmitting antenna by applying voltage at a voltage loop or antinode.

voltage feedback. Feedback introduced in series with the input circuit as the voltage drop across part of an impedance which is placed across the output.

voltage gain. Voltage amplification. A rating of an amplifier stage obtained by dividing the AC output voltage by the AC input voltage. It is less than the amplification factor of the tube by the ratio of the external plate impedance to the total plate impedance. As the external impedance becomes larger in comparison to the plate impedance the value approaches the amplification factor.

voltage gradient. The voltage per unit of length of a resistor or conductor; the voltage per unit thickness across a dielectric.

voltage multiplier. A precision resistor used in series with a voltmeter to extend its measuring range. Also, a power circuit with capacitors and rectifiers so connected as to deliver DC output voltages double, triple, quardruple, etc., the AC rms input voltage.

voltage node. A point having zero voltage in a system of stationary waves.

voltage rating. The maximum sustained voltage that can safely be applied to or taken from an electrical or electronic device without risking the possibility of breakdown.

voltage-regulating transformer. A power transformer designed to deliver an essentially constant output voltage over a limited range of input voltage values.

voltage regulation. The ability of a voltage source to maintain essentially constant output voltage during variations in load.

voltage regulator. A device or circuit that functions to maintain terminal voltage at a predetermined value, or varies the voltage according to a predetermined plan.

voltage-regulator tube. A gas-filled electron tube used to keep the alternating input voltage to electronic equipment essentially constant despite wide variations in line voltage, or to maintain an essentially constant direct voltage in a circuit. Also called voltage reference tube.

voltage relay. A relay that functions at a chosen value of voltage.

voltage saturation. The region in a diode volt-ampere characteristic curve below which the current is proportional to the three-halves power of the voltage; at and above which, current is independent of voltage. All emitted electrons are arriving at the anode. If emission is increased, saturation sets in at higher current and voltage values.

voltaic cell. A cell consisting of a conducting liquid (electrolyte) and two dissimilar electrodes. Such a cell can function as a source of electrical energy (from chemical energy). This is voltaic action. It is always possible to use such a cell across an external power source. This is electrolytic action. This may result in charging the cell, in electrolysis, or in rectifying action.

voltammeter. 1. A wattmeter. 2. An instrument that may be used either as a voltmeter or ammeter.

volt-ampere. The unit of apparent power in an alternating-current circuit containing reactance. It is equal to the voltage in volts multiplied by the current in amperes without taking phase into consideration.

voltmeter. An instrument for measuring voltage.

Volt-Ohm-Milliameter

volt-ohm-milliammeter. A test instrument having provisions for measuring voltage, resistance and current. It consists essentially of a single meter having the necessary number of scales, and a switch which places the meter in the correct circuit for a particular measurement.

volume. 1. In an audio-frequency circuit, the power usually expressed in decibels. 2. In general, the intensity or loudness of the sound produced by a headphone or loud-speaker.

volume compression. Limitation of the volume range of audio frequency sound amplitude to a variation of about 30 to 40 db at the transmitter, to permit using a higher average percentage modulation without risk of over-modulation.

volume control. A potentiometer or rheostat used to vary the audio-frequency output of an audio amplifier. Used in radio receivers, PA systems, and radio-telephone transmitters.

volume expander. A special audio-frequency circuit arrangement to increase the volume range of a radio program or phonograph record by making weak sounds weaker and loud sounds louder, thereby counteracting volume compression at the transmitter or in the record.

volume expansion. The use of a volume expander.

volume indicator. A type of high-impedance voltmeter, usually of the vacuum-tube type, designed to measure volume in an audio-frequency circuit.

volume unit. A unit used to specify the audio-frequency power level in decibels above a reference level of 1 milliwatt (0.001 watt). A volume unit (abbreviated VU) differs from a db in that the reference level need not be specified because it is included in the definition, which is not true of db.

volume-unit indicator. An instrument calibrated to read audio-frequency power level directly in volume units.

VSWR. Abbreviation for voltage standing wave ratio. See standing wave ratio.

v. Abbreviation for volt(s).

VT. A symbol used on diagrams to indicate a vacuum tube.

VTVM. A vacuum tube voltmeter.

VU. Abbreviation for volume unit.

W

W. Designates power in watts in radio and electronic mathematical relationships. The letter P often is used alternatively with W.

wafer socket. A vacuum-tube socket consisting of pin contacts fastened between two joined wafers of insulating material, into which are inserted the terminal pins of a vacuum tube.

Wagner earth. A refinement added to an impedance bridge to avoid the effects of capacitance to ground. Two additional resistance arms are used in series. Their junction is connected to ground, their terminals to the terminals of the bridge resistance arms. It is assumed that the junction of the bridge resistance arms is connected to one terminal of the detecting instrument. The other end is momentarily grounded and the auxiliary arms are adjusted to null. After re-connection of the detector to normal position it may be assumed that it is at ground potential.

walkie-talkie. A compact portable receiver-transmitter unit which is light enough to be carried in the hand or on the back of the operator, and which contains its own battery power supply.

wall outlet. A device installed at an outlet and permanently connected to the power-line wiring. It permits connecting a radio, television receiver or other electrical appliances to the power line. Also referred to as convenience receptacle or receptacle.

water-cooled tube. A vacuum power tube having the anode projecting through the glass envelope. Tube is so mounted as to permit circulation of water around the anode for cooling purposes during operation.

watt. The practical unit of electric power, and in a direct-current circuit, equal to volts multiplied by amperes. In an alternating-current circuit, true watts are equal to effective volts multiplied by effective amperes, then multiplied by the circuit power factor.

wattage rating. A rating expressing the maximum power which a device or component can safely absorb or handle. To determine how high a wattage rating is required for a particular resistor, multiply the value in ohms of the resistor by the square of the current which is to flow through the resistor (resistance × current × current), and choose a resistor having a wattage rating approximately twice the computed value so as to give ample margin of safety in operation.

watt-hour. A unit of electrical energy equal to the power of one watt being consumed continuously for one hour.

watt-hour meter. A meter that measures and registers electric energy in watt-hours or kilowatt-hours. The conventional residential meter is an example.

wattmeter. A meter used to measure the power in watts or kilowatts which is being consumed by a device, chiefly in a.c. circuits.

watt-second. One watt acting for one second; equal to one joule.

wave. A propagated periodic disturbance such as a radio, light or sound wave.

wave angle. The angle at which a radio wave leaves a transmitting antenna or arrives at a receiving antenna.

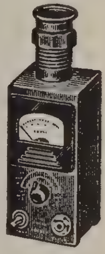
wave band. A band of assigned frequencies.

wave-band switch. A multi-position switch used to change the frequency tuning range of a receiver or transmitter from one wave band to another.

waveform. The graphical representation of the shape of a wave, showing variations in amplitude versus time.

wave guide. A hollow, round or rectangular pipe, commonly called plumbing, used as a transmission line for the propagation of microwaves.

wavelength. The distance measured along the direction of propagation, between two points which are in phase on adjacent waves. A wavelength is the distance traveled by a wave in a time of one cycle. Electromagnetic waves, including both light and radio waves, have a velocity or speed in space of approximately 300,000,000 meters per second. Thus from the above wavelength equals 300,000,000 divided by frequency. Light waves have wavelengths which are very small and therefore are measured in terms of microns, millimicrons and Angstrom units, which are very small fractions of a meter. Wavelength is the characteristic which distinguishes light of one color from light of another color.


Wavemeter

wavemeter. A calibrated variable frequency resonator used to determine wavelengths of radio waves or frequency of oscillations.

wave trap. A device sometimes connected to the aerial system of a radio receiver to reduce the strength of signals at a particular frequency, such as at the frequency of a strong local station which is interfering with reception of other stations.

wave velocity. The velocity of propagation of energy. The free space velocity of radiant energy is 3×10^{10} cm/sec. In a pipe or wave guide, the rate of energy transfer differs from the rate of travel of the electric field. The energy traveling with a velocity less than normal is called the group velocity. The electric wave with velocity greater than normal is called the phase velocity.

wax. The heavy blank wax disc used in making the master record required for the production of phonograph records.

weak coupling. Loose coupling, in a transformer.

Wehnelt cathode. A hot cathode having a metallic core coated with alkaline earth oxides.

Westrex system. The commercially accepted method for cutting stereophonic records. The record groove is in the form of a "V" and each wall of the "V" is at angle 45° from vertical. One wall of the groove has the recorded material of one channel; the other wall contains the other channel.

wet cell. A cell in which the electrolyte is in liquid form.

wet electrolyte capacitor. A capacitor employing a liquid electrolyte dielectric.

Wheatstone bridge. An instrument for measuring resistance.

wheel static. Interference encountered in auto-radio installations due to friction between tires and pavement.

white. The signal produced at any point in a facsimile system by the scanning of a selected area of subject copy having minimum density.

white level. The potential in a composite television signal which causes the brightest or whitest areas on the picture. Approximately 15% of total amplitude from zero to the peaks of sync pulses.

white light. Any radiation producing the same color sensation as average noon sunlight.

white noise. The electrical disturbance caused by the random movement of free electrons in a conductor or semi-conductor.

white noise record. A type of phonograph record used to test the frequency response of audio reproduction systems. Records of this type contain white thermal noise which extends over a very wide band of audio frequencies. This bandwidth is reduced progressively in steps while simultaneous announcements specify the top limit of the bandwidth at any given point.

white radiation. Any portion of the electromagnetic spectrum containing a continuous band of frequencies, with equal energy content at each frequency.

white-to-black amplitude range. In a facsimile system employing positive amplitude modulation, the ratio of signal voltage (or current) for picture white to the signal voltage (or current) for picture black at any point in the system.

whr, wh. Abbreviations for watt-hour.

wide-band axis. In color TV, the phase of the chrominance component with the wider transmission bandwidth. This component in the NTSC system is the I signal which is limited to a band of 0–1.5 mc.

width control. The control that adjusts the width of the pattern on the screen of a cathode-ray tube in a television receiver or oscilloscope.

Wien bridge. A type of capacitance bridge circuit for measuring dielectric losses. Two of the arms are RC branches—one series-connected, the other parallel. The circuit is the basis of an oscillator in which feedback is frequency sensitive.

wind charger. A wind-driven direct-current generator used for charging batteries, such as for charging 32-volt farm lighting-plant batteries.

wind-driven generator. A generator that derives its power from wind acting on a propeller attached to the generator shaft.

winding. One or more turns of wire forming a continuous coil. Also, the coil itself, as in transformer primary and secondary windings.

Williamson amplifier. An audio amplifier circuit developed by the British experimenter D.T.N. Williamson, in which tetrode output tubes are connected as triodes. Regular triode tubes are used in the first audio, phase inverter and driver stages.

Windom antenna. A multi-band transmitting antenna named after an Amateur who wrote a comprehensive article about it. The antenna is primarily used by Amateur radio operators because it provides satisfactory operation on even harmonics of its fundamental frequency. This feature permits using a single antenna on several Amateur bands. The original antenna consisted of an antenna wire cut to one-half wavelength of the fundamental frequency to be used, with a single-wire feedline connected 14% off center. Impedance is approximately 600 ohms. A modern version employs a 300 ohm twin line feeder connected about 35% off center.

wire. A rod or filament forming a metallic conductor having uniform thickness. Used in radio and electronics to provide a path for electric current between two points.

wire gauge. A system of numerical designations of wire sizes, starting with low numbers for the largest sizes. The American wire gauge, abbreviated AWG (formerly the Brown and Sharpe gauge, abbreviated B & S gauge) is in common use in this country and starts with 0000 as the largest size, going to 000, 00, 0, 1, 2, and up to 40 and beyond for the smallest sizes. Wire of size No. 40 is approximately 3 mils in diameter; No. 18 is about 40 mils in diameter. The cross-sectional area doubles every three sizes; the diameter every six sizes.

wireless record player. A motor-driven turntable and phono pick-up mounted in the same cabinet with an RF oscillator. The phono pick-up converts a recording into AF signals which modulate the RF carrier of the oscillator. The resulting signal is radiated through space, as a broadcast signal, and can be picked up by any radio receiver in the vicinity merely by tuning that receiver to the broadcast band frequency on which the wireless record player is operating.

wirephoto. Transmission of photographs or other single images over a telegraph system.

wire recorder. Instrument similar to a tape recorder, except that it utilizes a round stainless steel wire about .004" in diameter instead of the tape. See tape recorder.

wire telephony. The transmission of voice-frequency waves over wires.

wire-wound resistor. A resistor which is constructed by winding a high-resistance wire on an insulating form. The resulting element may or may not be covered with a ceramic insulating layer.

wobbulator. In one form, a motor-driven variable capacitor used to vary the output frequency of a signal generator periodically between two limits. Used for certain types of tests of electronic equipment, such as frequency-response tests.

Wollaston wire. Extremely fine wire made by inserting fine platinum or other wire in a silver tube, drawing the whole down and dissolving the silver.

woofer. A large loudspeaker designed to reproduce low (30-2000 cycles) audio frequencies at relatively high power levels. Usually used in combination with a high frequency loudspeaker called a tweeter.

working voltage. The voltage rating of a fixed capacitor. It is the recommended maximum voltage at which the unit should be operated. See peak voltage.

wow. Term used to denote distortion in a sound reproducing system, caused by periodic variation in the speed of the tape, turntable, wire or film.

wrinkle finish. A lacquer or varnish finish that may be applied with a brush or spray. It shrinks and folds as it dries.

w signal. See Y signal.

WWV. Call letters of the National Bureau of Standards radio station at Washington, D.C., maintained for the purpose of providing radio broadcast technical services. These services include time signals, standard radio frequencies, standard audio frequencies and radio propagation disturbance warnings. See time signals. The eight frequencies broadcast are 2.5, 5, 10, 15, 20, 25, 30 and 35 megacycles. These are modulated by 440 and 600-cycle audio signals. The propagation warnings are transmitted in International Morse Code; W indicates "warning" (poor conditions); U, "unstable;" N, normal.

WWVH. National Bureau of Standards radio station at Maui, Hawaii. Broadcasts on 5, 10 and 15 megacycles. WWVH is received at many locations not served by WWV, thus extending the area served by standard frequencies and time signals.

X

X. Letter used to designate reactance in ohms.

X_c. Symbol used to designate capacitive reactance.

X_L. Symbol used to designate inductive reactance.

X-axis. One of the axes of a piezoelectric crystal, being the line joining two diametrically opposite corners of the crystal. It lies in a plane at right angles to the Z-axis. Also, the horizontal direction on the face of a cathode-ray tube.

X-cut. Term referring to the cut of a piezoelectric crystal which is made perpendicular to any two parallel faces.

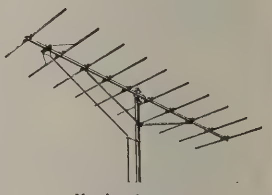
xenon. A rare gas used in hot-cathode, gas discharge tubes such as thyratrons.

X-rays. Radiation that has frequencies between the higher ultra-violet and the lower gamma rays. Produced by the impinging of electrons on a solid (called a target). Can penetrate opaque objects and affect photographic plates or produce fluorescence.

x-ray tube. A high-vacuum, high-voltage, hot-cathode, two-electrode tube which produces x-rays. Streams of electrons emitted from the cathode are directed on a target, usually of tungsten, producing x-rays by bombardment.

Y

Yagi antenna. A particular form of end-fire antenna array having maximum radiation in the direction of the array line. Consists of a driven element and a number of directors and reflectors placed, respectively, in front of and behind the driven element.



Yagi antenna

Y-axis. A line perpendicular to two opposite parallel faces of a quartz crystal. Also, the vertical direction on the face of a cathode-ray tube.

Y-connection. A network of three resistors or impedances connected together in the form of a star or Y.

Y-cut. A quartz crystal cut such that the Y axis is perpendicular to the faces of the slab.

yoke. 1. A piece of ferromagnetic material, without windings, that permanently connects two or more magnet cores. 2. A coil assembly used to produce electro-magnetic deflection of the electron beam in a cathode-ray television tube. It surrounds the neck of the tube.

Y signal. The luminance or monochrome portion of a color TV signal. In the NTSC color system, the total video signal is divided into two chrominance signals (I and Q) plus the luminance Y signal. The latter is equivalent to a complete monochrome video signal and makes possible the reception of a color program on a black and white TV receiver. Numerically, the Y signal is equal to 30% of the red camera signal, 59% of the green camera signal, and 11% of the blue camera signal. In some text books, the letter W is used in place of Y.

Z

Z. Letter symbol used to represent impedance in ohms.

Z axis. The optical axis of a quartz crystal. It is perpendicular to both the X and Y axes. In cathode-ray oscilloscopes, variation of the beam intensity by an external voltage is called "Z-axis modulation."

zeppelin antenna. A conductor that is some multiple of a half wavelength long and is fed at one end by one lead of a two-wire transmission line that is also some multiple of a half wavelength long.

zero adjuster. A device for bringing the pointer of an electric instrument or meter to zero when the electric quantity is zero.

zero beat. The condition in which a given circuit is oscillating at the exact frequency of an external radio wave so that no beat tone is produced or heard when the combined waves are demodulated.

zero-beat reception. A system of radio reception for suppressed-carrier systems of radio telephony, in which the receiver generates a voltage having the original carrier frequency and combines it with the incoming signal. Sometimes called homodyne reception.

zero bias. A condition in which the control grid and cathode of a vacuum tube are at the same potential.

zero level. The reference level used for comparing sound or signal intensities.

zero method. Any method of measurement in which the reading is taken after the circuit has been balanced to bring the pointer of the indicating instrument to zero. Also called balance method or null method.

zero potential. An expression usually applied to the potential of the earth, as a convenient reference for comparison.

zone of silence. The skip zone. A local region in which the signals of a given radio station cannot be satisfactorily heard.

Greek Alphabet

Greek Letter	Greek Name	English Equivalent
Α α	Alpha	a
Β β	Beta	b
Γ γ	Gamma	g
Δ δ	Delta	d
Ε ϵ	Epsilon	e
Ζ ζ	Zeta	z
Η η	Eta	é
Θ θ	Theta	th
Ι ι	Iota	i
Κ κ	Kappa	k
Λ λ	Lambda	l
Μ μ	Mu	m
Ν ν	Nu	n
Ξ ξ	Xi	x
Ο ο	Omicron	ŏ
Π π	Pi	p
Ρ ρ	Rho	r
Σ σ	Sigma	s
Τ τ	Tau	t
Υ υ	Upsilon	u
Φ φ	Phi	ph
Χ χ	Chi	ch
Ψ ψ	Psi	ps
Ω ω	Omega	ō

Letter Symbols for Vacuum Tubes

Grid potential	E_g, e_g
Grid current	I_g, i_g
Grid conductance	g_g
Grid resistance	r_g
Grid bias voltage	E_c
Plate potential	E_p, e_p
Plate current	I_b, I_p, i_p
Plate conductance	g_p
Plate resistance	r_p
Plate supply voltage	E_b
Cathode current	I_c
Emission current	I_s
Mutual conductance	g_m
Amplification factor	μ
Filament terminal voltage	E_f
Filament current	I_f
Grid-plate capacitance	C_{gp}
Grid-cathode capacitance	C_{gk}
Plate-cathode capacitance	C_{pk}
Grid capacitance (input)	C_g
Plate capacitance (output)	C_p

NOTE: Small letters refer to instantaneous values.

How to Get Started in Amateur Radio

AMATEUR RADIO is one of the most fascinating of all hobbies. With simple equipment a "Ham" can reach out in two-way communication to all parts of the world. From the privacy of his home he can talk with old friends and make new acquaintances in the Amateur fraternity, which numbers over 200,000 in the United States alone, and additional thousands scattered elsewhere in the world. Amateur radio has an important place in the community. When disaster strikes, it often is the only means of communication for an entire stricken area. The records of the American Red Cross and the American Radio Relay League, which coordinate Amateur emergency operations, contain numerous cases of public service rendered by Amateur operators during floods, hurricanes, earthquakes and other catastrophies. The contributions of Amateur operators in two major World Wars have proved the military value of a readily available pool of thousands of trained radiomen.

It's easy to get started in Amateur radio. You can count on friendly help from radio clubs and individual Amateurs. And there are several good manuals, written in simple, easily understood style, published specifically to help the newcomer.

Two highly recommended manuals are "How to Become a Radio Amateur" (Allied Stock No. 37 K 551 at 50c) and "Radio Amateur's License Manual" (Allied Stock No. 37 K 555 at 50c). Both are published by the American Radio Relay League. They explain the simple fundamentals of radio, show how to build and operate a radio station, and help the beginner get ready for the required license examinations. The licenses are issued without fee to any citizen of the United States who passes the Federal Communications Commission (FCC) examinations.

FCC Licensing Examinations. There are five Amateur license classifications. Of these, the General Class and Novice licenses are the most popular. The exam for the General Class license consists of a written test on theory and regulations, as well as a code sending and receiving test at 13 words per minute. You'll find it particularly easy to get started in Amateur radio by preparing for the Novice exam. This exam consists of a simplified test on theory and regulations and a code sending and receiving test at only five words per minute. The General Class license is good for five years and renewable without examination. The Novice license is good for only one year and is not renewable. However, the experience gained by the Novice, after one year of operating, provides excellent background for the General Class exam.

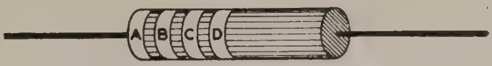
Preparing for license examinations. The "Radio Amateur's License Manual" contains the full set of actual examination questions and answers, which make up the written test. This manual makes it easy to prepare for the written test. The easiest way to learn the code is to do it with a partner, preferably someone who himself is becoming an Amateur. Procedure for learning the code is given in "How to Become a Radio Amateur". This, along with regular practice in sending and receiving, will prepare the beginner for his code test in a surprisingly short time.

An Amateur radio station is inexpensive. The beginner can achieve excellent results with inexpensive home-built equipment. Simple but practical receivers can be built at moderate cost, as can transmitters of standard design. Construction of the transmitter can be delayed until success in the Amateur license examination is assured.

An invitation to the beginner. The Radio Amateurs on the technical staff of the *Allied Radio Corporation* are always happy to answer any question you may have. When you have obtained your Amateur license, or while you are preparing yourself for the FCC examination, they will be glad to help you choose parts and equipment best suited for your needs.

HOW TO READ COLOR CODE ON RESISTORS

All carbon resistors are produced under standards set by the EIA (Electronics Industries Association). Under these standards the user is assured of uniform values and of a universal color-coding system that permits easy identification. To determine the value of a resistor, hold it with the colored bands reading from the left end, as illustrated, and refer to the color code chart.



EIA Color-Code Chart For Resistors

BAND A		BAND B		BAND C		BAND D	
Color	Value	Color	Value	Color	Number of Zeros	Color	Tolerance
Black	0	Black	0	Black	None	None	± 20%
Brown	1	Brown	1	Brown	0	Silver	± 10%
Red	2	Red	2	Red	00	Gold	± 5%
Orange	3	Orange	3	Orange	000		
Yellow	4	Yellow	4	Yellow	0000		
Green	5	Green	5	Green	00000		
Blue	6	Blue	6	Blue	000000		
Violet	7	Violet	7	Violet	0000000		
Grey	8	Grey	8	Gold	÷ 10		
White	9	White	9	Silver	÷ 100		

The first band (A) shows the first figure of the resistor value, the second band (B) shows the second figure, the third band (C) indicates the number of zeros to add. The fourth band (D), which is not included on all resistors, merely indicates tolerance: silver for ± (plus or minus) 10%, gold for ± 5%. If the (D) band is omitted, the tolerance is plus or minus 20%.

Here are a few examples:

BAND A 1st figure	BAND B 2nd figure	BAND C Number of zeros	BAND D Tolerance	Resistor Value Is	
Brown = 1	Black = 0	Black = none	Silver = ± 10%	10 ohms	± 10%
Orange = 3	White = 9	Brown = 0	Gold = ± 5%	390 ohms	± 5%
Yellow = 4	Violet = 7	Silver (÷ 100)	None = ± 20%	.47 ohms	± 20%
Brown = 1	Black = 0	Green = 00000	Silver = ± 10%	1 megohm	± 10%

Resistors are available in the standard EIA values shown in this chart.

Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms
0.47	2.2	10	47	220	1,000	4,700	22,000	100,000	470,000	2.2 meg.	10. meg.
0.56	2.7	12	56	270	1,200	5,600	27,000	120,000	560,000	2.7 meg.	12. meg.
0.68	3.3	15	68	330	1,500	6,800	33,000	150,000	680,000	3.3 meg.	15. meg.
0.82	3.9	18	82	390	1,800	8,200	39,000	180,000	820,000	3.9 meg.	18. meg.
1.0	4.7	22	100	470	2,200	10,000	47,000	220,000	1.0 meg.	4.7 meg.	22. meg.
1.2	5.6	27	120	560	2,700	12,000	56,000	270,000	1.2 meg.	5.6 meg.	
1.5	6.8	33	150	680	3,300	15,000	68,000	330,000	1.5 meg.	6.8 meg.	
1.8	8.2	39	180	820	3,900	18,000	82,000	390,000	1.8 meg.	8.2 meg.	

OHM'S LAW AND BASIC SERIES-PARALLEL FORMULAS

TWO RESISTORS IN SERIES: TOTAL $R = R_1 + R_2$

TWO RESISTORS IN PARALLEL: TOTAL $R = \frac{R_1 \times R_2}{R_1 + R_2}$

TWO CAPACITORS IN SERIES: TOTAL $C = \frac{C_1 \times C_2}{C_1 + C_2}$

TWO CAPACITORS IN PARALLEL: TOTAL $C = C_1 + C_2$

OHM'S LAW FOR D.C. WHERE R IS RESISTANCE IN OHMS, E IS VOLTAGE IN VOLTS, I IS CURRENT IN AMPERES, AND P IS POWER IN WATTS:

$E = I \times R$ $\qquad$ $P = E \times I$

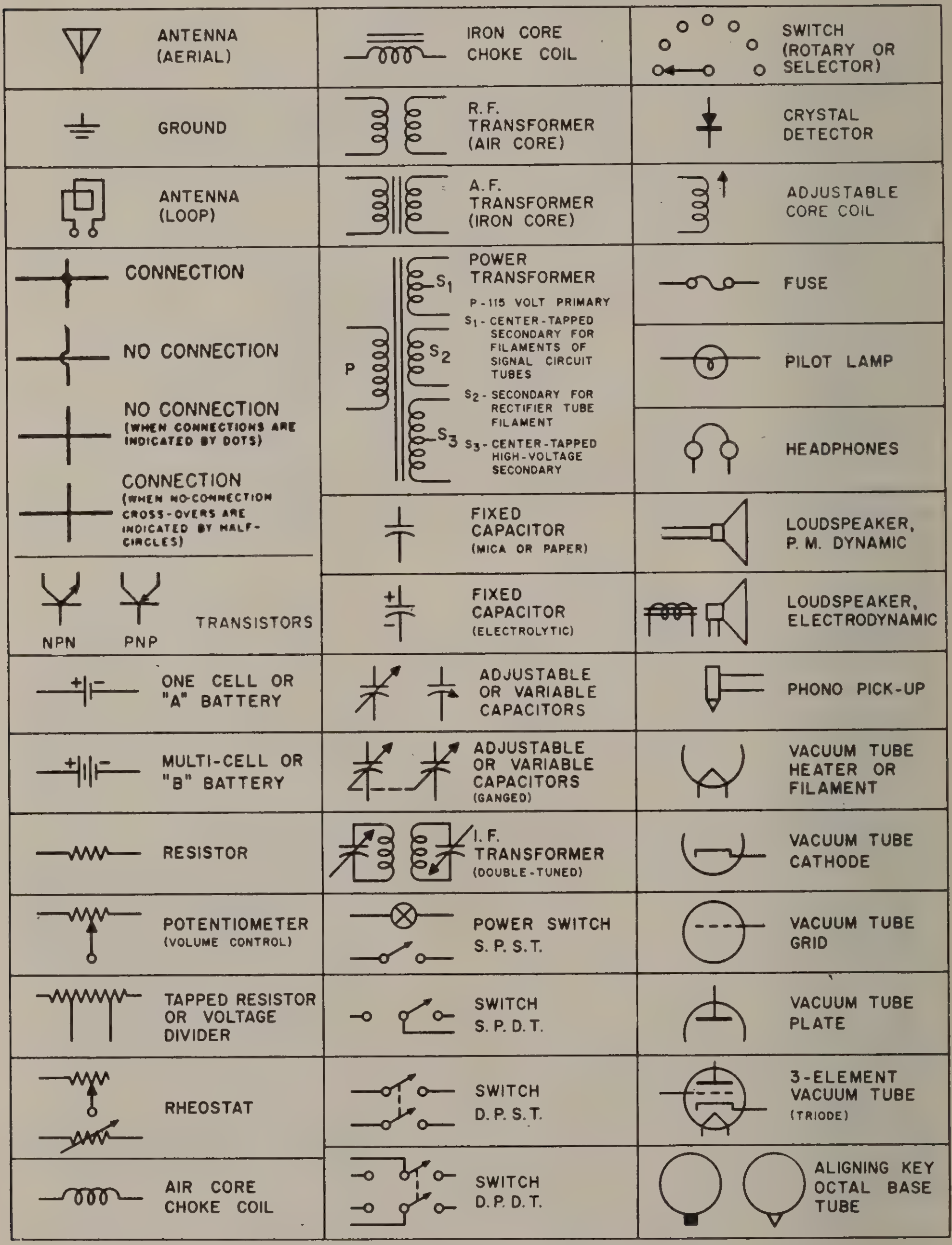
$R = E \div I$ $\qquad$ $P = I^2 \times R$

$I = E \div R$ $\qquad$ $P = E^2 \div R$

STANDARD SCHEMATIC SYMBOLS

The symbols below are standard in radio, TV and electronics diagrams. Popular components are represented. An industry-wide attempt is being made to standardize schematic diagrams. All current diagrams will be enough like these to easily identify the components. Note the two methods used to indicate a wire connection and a crossover. Both are in common use, but the curved wire crossover and dotted connection is preferred.

The symbol for a ground point may indicate an actual connection to the metal chassis, or a connection to a common lead, usually the B– voltage point. All ground points may usually be assumed to be connected together electrically.


ANTENNA (AERIAL)
GROUND
ANTENNA (LOOP)
CONNECTION
NO CONNECTION
NO CONNECTION (WHEN CONNECTIONS ARE INDICATED BY DOTS)
CONNECTION (WHEN NO-CONNECTION CROSS-OVERS ARE INDICATED BY HALF-CIRCLES)
NPN
PNP
TRANSISTORS
+
ONE CELL OR "A" BATTERY
+
MULTI-CELL OR "B" BATTERY
RESISTOR
POTENTIOMETER (VOLUME CONTROL)
TAPPED RESISTOR OR VOLTAGE DIVIDER
RHEOSTAT
AIR CORE CHOKE COIL
IRON CORE CHOKE COIL
R.F. TRANSFORMER (AIR CORE)
A.F. TRANSFORMER (IRON CORE)
P
S₁
S₂
S₃
POWER TRANSFORMER
P - 115 VOLT PRIMARY
S₁ - CENTER-TAPPED SECONDARY FOR FILAMENTS OF SIGNAL CIRCUIT TUBES
S₂ - SECONDARY FOR RECTIFIER TUBE FILAMENT
S₃ - CENTER-TAPPED HIGH-VOLTAGE SECONDARY
FIXED CAPACITOR (MICA OR PAPER)
+
FIXED CAPACITOR (ELECTROLYTIC)
ADJUSTABLE OR VARIABLE CAPACITORS
ADJUSTABLE OR VARIABLE CAPACITORS (GANGED)
I. F. TRANSFORMER (DOUBLE-TUNED)
POWER SWITCH S. P. S. T.
SWITCH S. P. D. T.
SWITCH D. P. S. T.
SWITCH D. P. D. T.
SWITCH (ROTARY OR SELECTOR)
CRYSTAL DETECTOR
ADJUSTABLE CORE COIL
FUSE
PILOT LAMP
HEADPHONES
LOUDSPEAKER, P. M. DYNAMIC
LOUDSPEAKER, ELECTRODYNAMIC
PHONO PICK-UP
VACUUM TUBE HEATER OR FILAMENT
VACUUM TUBE CATHODE
VACUUM TUBE GRID
VACUUM TUBE PLATE
3-ELEMENT VACUUM TUBE (TRIODE)
ALIGNING KEY OCTAL BASE TUBE

Abbreviations and Letter Symbols

Many of the abbreviations given are in lower-case letters. Obviously, however, there will be occasions such as when the abbreviations are used in titles where the original word would have been capitalized. In these cases, the abbreviation should be similarly capitalized.

A two-word adjective expression should contain a hyphen.

Term	*Abbreviation*
Admittance	Y
Alternating-current (adjective)	a-c
Alternating current (noun)	a.c.
Ampere	a
Angular velocity $(2\pi f)$	ω
Antenna	ant.
Audio-frequency (adjective)	a-f
Audio frequency (noun)	a.f.
Automatic volume control	a.v.c.
Automatic volume expansion	a.v.e.
Capacitance	C
Capacitive reactance	X_C
Centimeter	cm
Conductance	G
Continuous waves	c.w.
Current	I, i
Cycle per second	∼
Decibel	db
Direct-current (adjective)	d-c
Direct current (noun)	d.c.
Double cotton covered	d.c.c.
Double pole, double throw	d.p.d.t.
Double pole, single throw	d.p.s.t.
Double silk covered	d.s.c.
Electric field intensity	E
Electromotive force	e.m.f.
Frequency	f
Frequency modulation	f.m.
Ground	gnd.
Henry	h
High-frequency (adjective)	h-f
High frequency (noun)	h.f.
Impedance	Z
Inductance	L
Inductive reactance	X_L
Intermediate-frequency (adjective)	i-f
Intermediate frequency (noun)	i.f.
Interrupted continuous waves	i.c.w.
Kilocycle	kc
Kilohm	kΩ
Kilovolt	kv
Kilovolt ampere	kva
Kilowatt	kw

Term	*Abbreviation*
Low-frequency (adjective)	l-f
Low-frequency (noun)	l.f.
Magnetic field intensity	H
Megacycle	Mc
Megohm	MΩ
Meter	m
Microampere	μa
Microfarad	mfd
Microhenry	μh
Micromicrofarad	mmf
Microvolt	μv
Microvolt per meter	μv/m
Microwatt	μw
Milliampere	ma
Millihenry	mh
Millivolt	mv
Millivolt per meter	mv/m
Milliwatt	mw
Modulated continuous waves	m.c.w.
Mutual inductance	M
Ohm	Ω
Power	P
Power factor	p.f.
Radio-frequency (adjective)	r-f
Radio frequency (noun)	r.f.
Reactance	X
Resistance	R
Revolutions per minute	r.p.m.
Root mean square	r.m.s.
Short wave	s.w.
Single cotton covered	s.c.c.
Single cotton enamel	s.c.e.
Single pole, double throw	s.p.d.t.
Single pole, single throw	s.p.s.t.
Single sideband	s.s.b.
Single silk covered	s.s.c.
Tuned radio frequency	t.r.f.
Ultra high frequency	u.h.f.
Vacuum tube voltmeter	v.t.v.m.
Volt	v
Voltage	E, e
Volt-Ohm-Milliammeter	v.o.m.
Watt	w

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